The Builder.

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Illustrations of French Renaissance Architecture.

THE attention of English architects was recently directed to a thoughtful essay by M. César Daly on the subject of "Hautes Études" in architecture, and the advisability of attempting a more systematic study of the intellectual basis of architecture, the causes which influence style, &c. One result of this has been that attention has also been drawn to an important work brought out by the same able author a few years ago, under the general title, "Motifs Historiques,"* which, as an important contribution to the study and illustration of one series of styles, is not as well known in this country as it should be.

The heading of this article, "Illustrations of French Renaissance Architecture," expresses what is practically the range of the book, consisting of two large folio volumes of finely-executed plates, preceded by an essay on the intention of the publication, and on some architectural considerations in connexion with it; the more wide field indicated by the title "Motifs Historiques" refers apparently to a further extension of the series, of which the two volumes form only a section. But the reasons which the author gives for having published this collection of examples of the details of the French Renaissance styles are of some interest in regard to the general theory of architectural practice in modern times. The prevalent architectural taste in France at present is for the reproduction of the native Renaissance styles; and if one client demands a house in the Louis XIV. style and another asks for Louis XVI., the architect must be prepared to satisfy each. This no doubt is not art in the proper acceptation of the word; but architecture is for most of those who practise it a "*profession industrielle*;" if it is true that man does not live by bread alone, it is also true that he does not live without it, and to gain it he must satisfy his client. This is not, it is admitted, the highest view of the situation, but it is one which cannot be ignored; and it is partly to this end that M. Daly has offered his contemporaries a selection of examples of the various styles of detail and ornament of the French Renaissance, taken from old buildings of the period, and drawn out and engraved in the highly-finished style which has always characterised the illustrations of the *Révue Générale*, in the pages of which this collection was first published. So far, this only amounts to providing, for the architect anxious about his daily bread, examples to copy from and to overawe the client who may make any complaint. But this is only providing for the worst cases,—for clients bent on correct copying before anything else. The higher use which may be made of these examples is thus stated: "The architect is fortunately not always under the obligation to reproduce exactly the ancient forms of art; more often he is free to choose for himself the style which he prefers, and is under no necessity to look to old examples except for inspiration, for ideas,—*motifs*, as architects, painters, and sculptors say; themes, as a musician would word it,—which can be varied at his pleasure. Merely to reproduce the past, as has been observed, is not art; but to see in the combinations of an old fragment the *motif* of a new composition, and to evolve the latter out of it, is to some extent an act of artistic creation." Used in this sense, M. Daly goes on to say, the same example may become to various architects a *motif* to which each, while taking his first idea from it, may impart so much originality that the original *motif*, though at the bottom of the whole of the studies made from it, may be found to have become really lost from recognition under the individual development given to it by each architect. This is no doubt the real way to make use of ancient models, but though it is sometimes talked about in this sense, it is in reality seldom practised: partly because it is so much easier to copy than to improve upon an old thing, partly (it must not be forgotten) because in many cases clients are so narrow-minded, and will not be satisfied that they are getting the right thing unless they are shown chapter and verse for every detail.

Do you wish, for instance, says M. Daly, to design large folding-doors beneath a circular-headed arch, so as to harmonise them with the lines of the arch? You find an example in a Louis XV. front from rue du Cherche-Midi (vol. ii. plate 20). Or take another problem: to design a large monumental-looking doorway beneath an arch the full height of the ground-story, and to connect the whole with the design of a window above the door, so as to produce a united composition: The Louis XV. doorway from the "Passage du Dragon" is a good suggestion. In neither case need the details be adopted; the idea and the general arrangement may be worked out with different details; perhaps improved upon; and no doubt this is the way to make use of architectural illustrations of ancient work. The last-mentioned example, we may observe, is a very fine and bold design of its kind, in which the rusticated walling of the ground-story is carried round into an arched recess with sides semi-circular on plan, and the actual door placed at the back of the recess thus formed; there is something like it in the treatment of one or two doorways in Portland-place, but unfortunately in cement, not in stone. These instances suffice to show the idea which M. Daly has had as to the use to be made of these collected examples. The plates are mostly geometrical drawings, comprising elevations, plans, and sections of mouldings; there are a few perspective drawings, generally of special features such as dormers, chimneys, &c. The majority of the drawings are of parts of buildings; doors, windows, pilasters, &c., with details to a large size, it being in such details that a great deal of the essential character of the various styles consists: here and there elevations of a part of the whole height of a building are given to show the general balance of the parts, but few whole buildings are given, the object being to give precedents and examples of the characteristics of the styles illustrated, not of the form and arrangement of particular buildings. The plates commence with examples of architecture of the transition from Louis XII. to Francis I., beginning with a good many portions of the Château de Blois, splendidly drawn and engraved. The Hôtel de Lasbordes furnishes some exquisite details of pure Francis I. style; pity to reflect that none of the succeeding phases of the French Renaissance were to show anything so refined as this. The same method of illustration is carried on down to the Louis XVI. style, the plates illustrating each style being numbered separately. To the illustration of the Francis I. style 30 plates are devoted; the Henri II. counts 17 plates; Henri III., 14; Henri IV., 21; Louis XIII., 30; Louis XIV., 27; Louis XV., 26; and

* Motifs Historiques d'Architecture et de Sculpture d'Ornement—Première Série. Décorations Extérieures empruntées à des Monuments Français de commencement de la Renaissance à la fin de Louis XVI. (XVI^e, XVII^e, et XVIII^e Siècles). Par M. César Daly, Architecte du Gouvernement, &c., &c. Paris: Ducher & Cie.

Louis XVI., 33 plates; the index is also adorned with various smaller illustrations of buildings mentioned. But we will turn for a moment from the plates to consider the views as to the Renaissance style expressed in the preface, which are of some interest.

M. Daly has gone here into the subject of the essential qualities which constitute "style." What are the resemblances between buildings which lead us to class them as of the same style? In the first place, he suggests, style is duplicate; it has its constructive form and its æsthetic expression: every recognised architectural style has its own principle of construction and its own æsthetic expression. True, of course, as to the latter; but to say that each has "its own principle of construction" is putting it rather too broadly. There are very few *principles* of construction in building; there is the beam and post, the arch, with its various applications of the dome and the vault; there is the truss or girder, but these, after all, in regard to the whole building, are only a form of the beam principle. If we limit separate styles to those with a principle of construction special to themselves, we shall have very few styles indeed, and shall have to entirely revise our classification and our nomenclature. It would be more correct if we were to say "its own *system* of construction" for each style; "principle" is too extended and comprehensive a word; and in M. Daly's continuation of the subject the expression "système constructif" is, in fact, used, and that we accept as expressing one of the leading distinctions of style, but it is not the same thing as "principe de construction," which includes a great deal more. The differences in the system of construction are most marked in the manner of covering openings in the walls, and the manner of covering in the area of a building above; or in the author's own words, "Un méthode pour franchir les *vides linéaires* (premier degré du problème) et les *vides superficielles* (deuxième degré du problème). Un style n'arrive à sa perfection organique, comme nous le verrons, que lorsque se double problème est résolu par le même élément géométrique, et que cet élément est aussi celui qui exprime le sentiment esthétique des contemporains." He goes on to remark how the Greeks used the same system for covering both the wall opening and the area; the Roman being a mixed style in this respect, and the Byzantine purely round-arched; the Gothic purely pointed arched. "In constructive system then, architecture started from the straight line to arrive at the pointed arch" in its covering system.

"Ainsi, chacune des grandes formes historiques de l'architecture, universellement reconnues comme constituant des styles distincts, offre ce double caractère: un système special de la *construction*, et une esthétique qui lui est propre; système constructif et conception du Beau conduisant tous deux à l'adoption *d'une même forme géométrique* comme *base du style*, et montrant ainsi l'accord qui a toujours existé, à certaines périodes de l'histoire, entre les besoins de l'esprit et les sentiments de l'âme, entre les facultès rationelles et le sensibilité esthétique. Telle est l'analyse du sens qu'il faudrait attacher à l'expression: 'un Style de l'Architecture.'"

Then comes the question, on this definition of style, is the Renaissance a "Style," or "has there been a new style of architecture since the fifteenth century?" M. Daly finds that the Renaissance did introduce a new constructive and expressive element into architecture, namely the three-centred or elliptic arch, which constitutes, to his thinking, one of the "traits significatifs" of modern architecture:—

"On retrouve les courbes elliptiques franchement accusées, dans notre pays, sous tous les rois, depuis la fin du XV^e^ siècle jusqu'à la fin du XVIII^e^. Abandonnée un moment pendant la domination de l'Ecole doctrinaire ou classique d'architecture du premier Empire et de la Restauration, l'ellipse est apparue de nouveau dans nos monuments, depuis que l'étude de nos édifices nationaux de tous les siècles a pris faveur parmi nous. L'Arc elliptique figure aussi dans quelques rares constructions de l'antiquité, accidentellement il est vrai, mais assez pour prouver que celle forme a été connue des vieux âges, sans qu'elle ait en la puissance, antérieurement aux temps modernes, de satisfaire au sentiment esthétique des populations."

In the ellipse, then, M. Daly thinks the Renaissance found that "forme mère," at once constructive and æsthetic, which has been shown to be the necessary origin and foundation of every perfect style of architecture. The predilection of English architects of the new school for the elliptical arch is a fact to be noticed in connexion with the subject; it has certainly become a characteristic of the new English Renaissance, as it was to a considerable extent of the Queen Anne and Georgian architecture. It would be weighting the elliptic arch rather heavily, however, to make its presence the constituent of a separate style, nor do we gather that M. Daly wishes to lay that burden upon it. He rather points it out as a factor in a new style which has not yet been systematically worked out. As he observes, engineers in modern work have used it for scientific reasons, in bridges; and architects have used it for picturesque and æsthetic reasons: each use of it has been one-sided. M. Daly hopes, or at least suggests the possibility, that its æsthetic and mechanical properties may one day be the subject of systematic study: is it possible, he asks, that from this form a new style of architecture is to spring, assisted also by the influence of various materials so much more used in modern than in ancient architecture, iron more particularly? That is the secret of the future; but the whole suggestion in regard to the possible influence of the elliptical arch is interesting and worth following up further. A general synopsis or table of generations, a family tree, of the past and possible styles is given by M. Daly, in which we have first the two styles (*Styles Primaires*) of the "Ligne Droite," Egyptian = rectilinear evolution in the first degree; Greek = rectilinear evolution in the second degree. We confess we are totally at a loss to understand why Egyptian and Greek architecture represent the first and second degrees respectively, as those degrees were before defined. It cannot be said that Egyptian architecture only covers over "vides linéaires," and not "vides superficiales," though it may be admitted that the Greek achieves the latter more completely and scientifically. Then follows the Roman as the transition from straight-lined to curvilinear styles, a "Mixte" which intervenes between the styles of "Ligne Droite" and those of "Arc du Cercle." The latter (*Styles Secondaires*) are divided into simple curvilinear evolution of the first degree (Byzantine and Roman), and simple curvilinear evolution of the second degree (Gothic). If the first stand for round-arched and the second for pointed-arched styles, this is intelligible; but it does not tally, again, with the former definition of first and second degrees. Then follows another "Mixte" period, transition from "simple curvilinear lines" to "superior curvilinear lines," leading to the two sections of ellipse style (*Styles Tertiaires*) of which the evolution in the first degree is now in progress, the evolution in the second degree has yet to come. All this is put in a beautifully logical manner, and though things in artistic development do not arrange themselves quite so systematically as this, there is really a good deal in it that is "probal to thinking," and it may turn out more true in fact than is at first apparent.

It results naturally from the foregoing considerations that the Renaissance architecture in France cannot at any of its periods be reckoned as entitled in the fullest sense to the denomination of a "style," though the architecture of the periods of Francis I. and Louis XIV. approaches very nearly, in M. Daly's judgment, to the condition of a style, owing (especially in the case of the Francis I. manner) to the remarkable unity of feeling which pervades these styles (for we must still for convenience use the word), and the manner in which they were adopted over the whole country. But he would point out that this apparently national character was not national in the same way which characterises the architecture of Egypt and Greece and the middle ages, all of which were developed from the habits and artistic inclinations of the people. The national character of the French Renaissance styles, especially of the two reigns just referred to, is imposed from above instead of growing from below; the unity is the unity influenced by despotic power; it is the product of the regal authority which says "L'Etat, c'est moi." In the case of Francis I., the despotism was partly an intellectual one; that king, through his own taste and that of the great artists whom he collected around him, influenced the national taste in a more legitimate manner than by mere despotic force of will; but on the whole there can be little question that M. Daly's distinction between these and the genuine national styles is correct; they are styles of the court and aristocracy, not of the nation.

The Francis I. style has, in its full development, more to our mind of the characteristics of a style than any of the other varieties of the French Renaissance. It achieved in a great measure what is at any rate the most important step towards the evolution of a new style out of old materials, viz.: the harmonising of what at first sight might seem incongruous elements. The mullioned window and the *encadrement* of pilaster and frieze appear, in the best examples of Francis I. architecture, to have always belonged to each other, and we quite lose the sense of their being survivals from two different styles and periods of architecture. With a remarkable tact and perception of congruity and proportion, the Classic pilasters, in such an example as that given by M. Daly from the Hôtel de Lasbordes, are assimilated to the mullions by being thinned down to more slender proportions than their Classical anti-types; so that the pilaster comes to be, in geometrical aspect, little wider than the mullion, and partakes of the decisively vertical character of the latter. It is true the pilaster is flat and carved on the face, and the mullion is moulded on the "chamfer-plane," but the two details seem to go together in some way. The unity is hardly so complete when small Classic columns of the usual proportion are substituted for the pilasters on other side of the mullioned window. The caryatide figures from another window of the Hôtel Lasbordes, however, of the Henri II. period, shew well enough on either side of the quasi-Gothic window. The finish of these caryatides, which are woman to the waist only, is characteristic of the extravagances of the day; it consists of two fluted scrolls, crossed and recrossed, and turning up at the ends into human heads. Another window from the same building, with male supporting figures, shows crossed lions' (?) legs, a still worse and more repulsive kind of detail.

In the Henri II. examples we find the Gothic mullion, in its masonic form, departed, and its place taken by wooden sash-bars, with very inferior architectural effect; and in place of the flanking pilasters and columns, we find pilasters of the Elizabethan form (apparently first suggesting themselves here), diminishing downward. The Italian forms of architrave begin to appear, and in the Hôtel d'Assezat, at Toulouse, in place of the elegant moulded mullion of the Francis I. style, we find a large heavy transom of square section, with console uprights in the centre of the window. In the Château d'Ault we find the Roman orders in full swing: the Doric on the ground story, Ionic above (with the window with square-section transoms and mullions between), and Corinthian at the top. The detail ornaments have a manner of their own; they are Classic in general form, yet with a certain Gothic breadth about them. With the Henri III. period we get the window dressings built up into more elaborate compositions, on which the spirit of Rococo is already beginning to breathe: the en-framing pilaster has disappeared, the Classic details begin to form a part of the design instead of being merely a frame to it. In the door from a house in the rue de la Pomme, at Toulouse, we find a door and window, one over the other, each flanked by orthodox columns, Roman Doric below and Corinthian above; but the characteristic detail is the big scroll

ending in a kind of guilloche, which is stuck on, for no possible use and with no reference to the general design, on each side of the upper columns; a kind of foretaste of what is to come in the days of Louis XIV. The extent and rapidity of the changes in taste as to detail, in the course of a few years, is evidence at all events of the vitality of interest in architecture at the time; the constant effort at improvement (for each change was no doubt regarded as improvement by those who made it), and rapid abandonment of the old manner for the new. In the Henri III. and IV. manner, we find the treatment of the pilasters quite altered; a system of rather heavy fluting superseding the old elegantly-carved pilaster panels: more architectural in a sense, but less graceful. The designs of doors and windows begin to show a system of putting together Classical details in a kind of piecemeal fashion, as if they were put together by a joiner rather than as if built on masonic principles. In the Henri IV. period ornament begins to get big and florid; cornucopias flourish on the cornices of windows, or oval "fanlights" are mantled in carved drapery. The descent from the Francis I. style, in taste and refinement of detail, is melancholy. In the style Louis XIII. begins that peculiar love of curves and twists in decorative detail which was carried to such an excess in the succeeding reigns. One of the most marked examples of this is in the details from the Protestant church in rue St. Antoine, where we have the cartouche in full development; also seen on a door from the old Sorbonne buildings. Among the good examples is a fine and sumptuous pair of entrance doors from a house in Rue Pavée-St. André-des-Arts, Paris, with panelling designed in a very effective fashion, and a carved acanthus frieze crossing the doors at the springing-line of the arch: Mr. Blashill will find this door (Plate 8 of Louis XIII.) worth his attention.

The Louis XIV. style, as far as its merits are concerned, is essentially an interior style. Regarded as exterior architecture its rococo ornaments are tawdry and frivolous, but regarded as room-decorations they have a merit of their own which is sometimes overlooked by those who (rightly) condemn the style as vulgar and ostentatious. It is so; but it is more of a *style*, decoratively speaking, than any other French Renaissance style except Francis I. In the intermediate periods there was a good deal of jumbling of incongruous details; florid ornament along with stiff and square architectural forms. In the Louis XIV. style the whole of the details have become assimilated; there is a unity about it; and, bad as much of it is in detail from the standpoint of pure taste, it produces as a whole a decidedly rich decorative effect. A room well decorated in this style, and without considerations of economy (which is nowhere in Louis XIV. work), has a remarkably palatial look, and the decoration is generally well distributed and massed; as long as we avoid looking too much at the details or "considering too curiously" their relation to art and nature, we receive a general impression of sumptuousness carried out on a system, and there is more power in the detail than in the more refined fripperies of Louis Quinze, of a good deal of which it may be said that they display all the bad taste of Louis Quatorze without the unity of style and power which often characterises the latter.

In a purely architectural point of view the style Louis XVI. is superior to either, in that it brings the ornamental work more within the guiding-lines of the architectural framework. Indeed, as a piece of street architecture of the Classic type, the front of a house in the rue des Francs-Bourgeois, given by M. Daly as the first example of Louis XVI., is in admirable taste. This is a house with simple square-headed windows in a rusticated basement story, above which is a Roman Doric order of fluted pilasters with two stories of windows between, with a wide flat fluted string-course or frieze separating the lower from the upper windows. All the carved ornament is concentrated on the doors and over the door opening, with a little bit of carving marking the centre window of the first floor. There is a purity of taste about this elevation which is remarkable for the period, and the whole is admirably proportioned and composed. The Hôtel d'Entragues, rue de Tournon, has similar merit, though it is a more utilitarian and less Classical composition.

The whole collection of illustrations is one of great interest and beauty, very well selected as furnishing typical examples of the period of architecture illustrated, and a most valuable work for reference and study in regard to French Renaissance architecture.

NOTES.

ON Monday last Lord Lamington made an attempt, as he has done once or twice before, to impress on the public mind through the House of Lords that national architecture is a matter worth thinking of. He pointed out how the discussion on the War and Admiralty Offices had been going on for twenty-five years, and yet nothing was done, while the country was paying a large annual sum for the hire of rooms in a nest of mean buildings. The country had been assured that steps would be taken to provide a suitable building for the National Portrait collection, but nothing more had been heard of it. Lord Lamington went on to draw the same kind of comparison between the attention paid to architecture in this and in Continental countries which we have often drawn. He said that "this seemed to be the only country in the world where no interest whatever was taken either by the rulers or the people in the beauty of its metropolis. In Rome, Paris, Berlin, and Vienna the public buildings were worthy of great capitals, and even in our colonies the people took great interest in their public buildings; but here nobody seemed to care. With regard to the new buildings on the west side of Westminster Hall, he admitted that outside the work was well done; but inside it had been discovered that there was no space, according to the plans, to make a necessary passage, so that the rooms ran into one another and were no use at all." Lord Lamington has missed the real point about the Westminster Hall "restoration" (at least if his remarks are fully reported), which is that it is building done under pretence of restoring something that was there before, and not on any grounds of architectural propriety or practical usefulness, which have only been pretended afterwards in order to justify the scheme to an ignorant and indifferent public. Lord Henniker answered in the usual commonplaces; these questions had been answered several times before, &c., &c. It is characteristic of the state of public opinion on the subject of architecture that the *Times* in a leading article dismisses Lord Lamington's appeal about national architecture with a sneer, but refers to "a question of much greater moment" asked by Lord Fortescue, in regard to the threatened infringement of the building frontage in Marylebone-road! That is the way things are looked at in this country, and in this respect the *Times* is the true exponent of English public opinion. The advancement of national architecture, the erection of public buildings worthy of the nation, is a matter to be dismissed as a joke; but over a question of frontage-line we can become eloquent and enthusiastic.

IN our article last week on the Forth and Clyde ship canal scheme, the disabilities under which the existing Forth and Clyde Canal labours were, perhaps, scarcely put so definitely as they might have been. As stated, the canal presents twenty differing levels, requiring that number of locks to surmount the series, from the lowest or sea-level to the highest or summit-level; but it has to be remembered that these variations are of necessity in duplicate, to admit of a corresponding descent on the other side of the isthmus; and in point of fact the actual number of locks encountered between the two seas is thirty-nine, representing a proportion of rather more than one stoppage for every mile of the way. Moreover, the canal is to a large extent an elevated or overborne work, affording passage *underneath* for many of the roads, railways, streams, and drains intersecting it,—a condition which of itself alone appears to shut out all practicable possibility of deepening or widening, except on the most meagre and incomplete scale.

THE thirteenth "Hallisches Winckelmanns Programm" is an interesting contribution to the literature of Praxitelean art. Dr. H. Heydemann publishes for the first time a marble head now standing in the courtyard of the Palazzo Riccardi, at Florence. Probably few who go to the Palazzo to see the wonderful Benozzo Gozzoli frescoes have ever given it a look. It is, however, as Dr. Heydemann clearly shows, an echo, and no faint one, of the statue of Eubouleus by Praxiteles. Since Dr. Benndorf's acute identification of the Eleusis head, now in the Central Museum at Athens, the hero Eubouleus, whose very name was matter of obscure mythology, has been a prominent figure in the archæological world. The Eleusis head, which Dr. Benndorf believes to be the original, is much damaged. The nose, upper lip, and eyebrows are almost entirely broken away. It is only when these are restored, and specially in seeing the face in profile, that the marvellous likeness to the Hermes of Praxiteles comes out. The Riccardi head is almost intact, so that it affords valuable material for the restoration of the other. Dr. Heydemann fully accepts Dr. Benndorf's identification, and differs from him only in this one point—that he does not accept the Eleusis head as an original. Dr. Heydemann, while doubting this, candidly states that his adverse view,—based chiefly on the technical working of the chisel-marks, and especially in the treatment of the drapery,—is formed only from a study of a cast. He gives in two phototype plates the side and front views of the Riccardi head, and four views of the Eleusis head—two of the original state of the marble, and two of it restored. To his very interesting criticism he adds a discussion of the other possible art representations of Eubouleus on vases and sarcophagi.

SOME of the good people at Bath seem to be making a very foolish agitation for a new civic coat of arms for the city, apparently on the ground that the arms should be authoritatively made identical with those on the city maces, which only date from 1708. Bath had a coat of arms confirmed in 1603, emblematical of Bath as a city of waters, which is therefore a century older than the one which it is desired to confirm now. As the whole value of a coat of arms in these days lies in its antiquity, as forming a historical connexion with the past, the attempt to substitute a more recent one, of apparently irregular origin, seems very absurd.

DR. BLAXALL'S report to the Local Government Board, dated 1st February of this year, on the state of the Keynsham Rural Sanitary District, deals with the causes of an excessive mortality from scarlatina in the sub-district of Bitton. The report confirms complaints which had been unofficially made against the Keynsham Rural Sanitary Authority for neglecting its duties in regard to provision for drainage. The following quotation from the report indicates the nature of the neglect complained of:—

"The Kingswood Hill sewer was laid down in accordance with a plan devised by the late Inspector of Nuisances. I am told it is constructed of glazed pipes, but the information forthcoming as to whether the joints were properly cemented is conflicting. No provision has been made for flushing it; nor, until recently, for its ventilation; but now one 6 in. ventilating-shaft has been inserted. . . . This sewer runs open during part of its course, receiving on its way the contents of a sewer from Poor House-lane. Both sewers pass in the near vicinity of dwellings, and loud and general com-

plaint was made to me of great nuisance arising from them throughout their course. I am informed that proceedings have been threatened against the Authority.

I have no doubt of the urgent necessity of prompt remedial measures in the matter of sewer provision for the district.

There are no proper means of disposing of the sewage of the district, but the several sewers discharge into streams and brooks that flow into the river Avon, which receives also the sewage of the city of Bath and other towns situated higher up its course. With regard to this highly-polluted river, one cannot but feel apprehensive lest it might become a means of disseminating disease amongst residents along its banks, and bargemen and others employed on its waters.

The Brislington brook is so intensely polluted by sewage as to create unbearable nuisance, and I heard of several instances in which cases of illness had been ascribed, apparently with justice, to the effects of effluvia arising therefrom. Summer after summer has this brook been the source of trouble to the Authority, who have expended a great deal of money in cleansing it and in putting down and working hatches to dam the water; but they have never gone to the root of the evil by providing for the removal and proper disposal of the sewage instead of allowing it to go into the brook."

In a further paragraph the report says:—"From the description already given of the sewers, drains, and privies, it is evident that the soil around and about dwellings is saturated with filth, and that any wells sunk in this soil must run constant risk of pollution. I found the distance between the wells and one or other source of contamination to vary from 6 or 8 ft. to as many yards, and more. Not infrequently percolation into the wells was seen from the direction of cesspits.'

NO. 14, Regent-street, which is to be put up for sale next month, is the house which John Nash, architect, built for his own occupation, when, under the Act 53 Geo. III., c. 120 (1813), he transformed the line of Edward, Bolsover, and Swallow-streets, and parts of Vine, Air, and Castle-streets, together with portion of St. James's Market, into the present Regent-street, Quadrant, and Waterloo-place; and thus carried out Gwynne's earlier project, at a cost exceeding 1,530,000*l.* The several blocks of buildings were designed by himself, Abraham, Decimus Burton, Soane, Repton, and others. The next house, No. 16, at present the Raleigh, and formerly the Parthenon Club-house, Nash built for Mr. G. Edwards. To his own residence he added a large apartment, copied from a loggia at the Vatican, and had it decorated with copies of some of Raffaelle's pictures. He died at East Cowes Castle, aged 82 years, on May 13, 1835. At Easter, 1849, this house was opened under the name of the "Gallery of Illustration," for the exhibition of Messrs. Grieve & Telbin's popular diorama of the "Overland Mail." It since formed the home of Mr. and Mrs. German Reed's entertainment. After the removal of that company to St. George's Hall, in Langham-place, the gallery was converted into the Pall Mall Restaurant; and has latterly been occupied by the Junior Constitutional Club. This property is held directly from the Crown for a term of 99 years, from 5th April, 1819, at a yearly rent of 454*l.* 11s., which includes a payment in lieu of land-tax, and is now let on lease at 1,200*l.* a-year. The rack-rent is estimated to be worth over 2,000*l.* per annum.

THE Whitehorse Close, near Holyrood Palace, is well-known as one of the most picturesque "bits" of Old Edinburgh. It has been for some years in a state of decay, many of the quaint gables which give it character being formed of wood; and, in passing, it may be noted that the native timber originally used is less decayed than the portions which have been patched-up with imported timber. The whole building is undergoing restoration, at a cost of 2,400*l.*, and every endeavour will be made to retain its ancient characteristics. The building is now divided into numerous small dwellings, but the "White Horse Inn" was originally the principal inn of Edinburgh. It was here that Dr. Johnson put up when on his Scotch tour.

THE annual report of Mr. John Price, the Surveyor to the Toxteth Local Board, Liverpool, contains some useful experience and statistics in regard to sanitary work in his district. It appears that the Board once a year flush out the drains of each dwelling-house, every gully, water-closet, or trap receiving attention; the men clean out the traps, but should anything be so closed up that flushing will not effect a clearance, then it is entered in a book, and a return made to the Nuisance Department, who then serve the necessary notice. This amounts to a practical yearly inspection, and is carried out at a rate of 1s. 4d. per 1,000 per annum, at a density of 16 per acre. The following passage in the report is also worth noting:—

"It having been discovered that a portion of the Hartington-road Sewer, between Boswell-street and Smithdown-road, was low and out of gradient, it has been altered by raising the invert to the proper gradient with cement concrete, thus preventing to a great extent the deposit of sediment,—a most fruitful source of bad smells. The deposit chiefly found in the invert of sewers having fair gradients consists of road detritus, and this is a great argument in favour of having the gullies near together and frequently emptied."

The report is very clearly and systematically drawn up.

THE Museum of Science and Art in Chambers-street, Edinburgh, is now completed, with the exception of the three groups of sculpture upon the pedestals above the cornice over the main entrance. The commission for these has been given to Mr. John Rhind, and the sketch-models for the groups have been approved of by the local representative of her Majesty's Board of Works and Sir R. Murdoch Smith, R.E., the Curator of the Museum. The central group will consist of a female figure, 10 ft. high, representative of Science, having a lamp in her left hand, and on her right a skeleton globe. On either side there are seated figures representing,—on her right,—the engineer or metal-worker, holding a wheel, while beside him is a model of Nasmyth's steam-hammer, and at his feet there is a boy with a miner's pick in hand, and safety-lamp on his head. The figure on the left, representative of textile manufactures, is seated on bales of cloth, and carries a bobbin and spindle, and at his feet there is a boy with additional symbols. This group will be upwards of 15 ft. in width. The two side groups will each consist of a central figure about 6 ft. in height, with attendant figures extending to a width of 6 ft. 6 in. One of these is to be representative of Natural History, and the other of the Applied Arts. The principal figure in the Natural History group will be seated on a camel, supporting on her knee a lion's skull. A small figure with a pelican and serpent completes the group. The large figure in the Applied Arts group carries a palette and brushes; while the minor figure is engaged in chasing a casket. The sculpture is to be executed in Doddington freestone. The groups are expected to be ready for placing in position in the course of the ensuing summer.

AT the exhibition at Messrs. Tooth & Sons' Gallery are to be seen three new works by Meissonnier, two of them representing the finest qualities of his art. One of these is a water-colour on a much larger scale than the old class of Meissonnier works. It is entitled "Vieille Poste Française" (28), and is a street scene in an old French town, where a man on horseback, with a led horse, is talking to two women at the door of an inn. The horses are splendidly drawn, and the open-air appearance of the scene is remarkably true. "En Reconnaissance" (29) is an oil-painting in the old style, also remarkable for the splendid drawing and painting of a horse in a fore-shortened position; the character in the figure looking through the field-glass is also in Meissonnier's best way. The other is a single-figure painting of less interest: "On Guard" (27). To see three new Meissonniers ought to be no little attraction to this gallery. Among the other works are a remarkable Fortuny, "Le Jardin du Poète" (125), repellent to our taste, but a wonderful *tour de force* in colour; some good landscapes by a new Scotch artist, Mr. David Farquharson, especially "Strathtay" (81); a fine academical work, "A Siesta" (52), by Herr Kiesel; some clever little battle scenes, especially "In Ambush" (41), by Herr Velten; a good picture of Sadée's (122), which we seem to know; and a small picture by Mr. Godward (110), which is the best imitation of Mr. Tadema we have seen, and promises well for its author when he gives up imitating.

A CORRESPONDENT suggests that the London County Council might find a fine site for a new building for their offices on the ground now occupied by the old Sessions-house, close to the Westminster Hospital. The site is, we believe, open to purchase, and was talked of for a modern building before. The position is almost an ideal one as far as it goes; but unless some of the neighbouring property could also be acquired, there would not be room enough, as the ground occupied by the Sessions-house itself is much too small; and unless the whole of the old Stationery Offices and their adjuncts were cleared away, part of the site would have the character of back-land. It is the Sessions-house site only that stands well as things are at present. We give currency to the suggestion, though hardly regarding it as a practical one.

LORD MAGHERAMORNE could hardly have done better to increase the contempt with which the Metropolitan Board of Works has been recently regarded than by the tone and manner of his reply to Lord Fortescue's appeal that the Board should postpone action in regard to the Marylebone-road frontage, and leave it to be dealt with by the County Council. Most people would suppose that the proper attitude for a Board just going out of office was to avoid legislating on debateable matter. But the Chairman of the Board seemed to think this an opportunity for posing in a magnificent attitude, and intimating loftily that the Board did not intend to be interfered with by the County Council in the execution of their duty. In reply to a natural comment from the Earl of Kimberley that this doctrine was not in accordance with the duty of a public body in the position now occupied by the Board, Lord Magheramorne "thought it evident that the noble lord who had last spoken had not studied the subject in such a manner as to enable him to instruct their lordships upon it." This is truly delightful as coming from a man who is well known to be a mere ornamental chairman with no practical knowledge of building work, whose sole part has been to keep order at the meetings of the Board, and who could not always do that.

CONSTRUCTION.*

BY PROFESSOR AITCHISON, A.R.A.

As architects, our sole object in studying the architecture of nations that have passed away is to improve ourselves in our profession.

As architecture is the visible expression by building of such of the needs, knowledge, skill, taste, and the ruling passion of a nation as can be so expressed, we first try to discover from the building or ruins what the needs were, and how they have been provided for, and what was the ruling passion, what was the knowledge and skill of the architect, and how his canons of taste agree with ours. We then try to find out more, and to test our solutions by the study of the nation's literature. Architecture, too, as far as the architect is concerned, is compounded of three diverse elements, which may be roughly said to call for ingenuity, science, and taste. It would therefore ill become me in any case to omit the

* Being the Sixth and concluding Royal Academy Lecture on Architecture this Session, delivered to the Students of the Academy, on the 14th ult. (For the previous lectures see *Builder*, pp. 85, 103, 121, 142, 163, and 181, *ante*.)

consideration of any one of them; but when studying Roman architecture, to omit the scientific side would be to leave out the part in which they have shown the greatest mastery; and when I use the word science, I do not use it in the modern sense of mathematical formulæ, based on experiment, but that skill which is the result of keen observation and experience. The all-conquering legions of Rome did not more clearly point to strength, activity, endurance, courage, and discipline in the men than these qualities pointed to the excellence of their system, and to the wisdom and skill of those who brought these qualities to perfection, and to the organising power, the strategy, and tactics of the generals. In like manner, the gigantic structures of the Romans point to the science, ingenuity, and the peculiar æsthetic gifts of the architects, to the knowledge, skill, and care of the surveyors,* the organisation and integrity of the builders, the honesty and skill of the workmen, as well as to the national pride in the permanent, magnificent, and dignified. Roman architecture, from the later time of the Republic to Byzantine days, was almost wholly clothed architecture: when built it was complete in itself, faced as it was with neat brick or ingenious stonework, and had then to be turned over to the art architect to clothe it, meanly or handsomely as the case required, when it wanted clothing,—*i.e.*, either with stucco, or with splendid marbles, bronze, and glass mosaic. I said it was almost wholly clothed, for the points of support, where the timbers or groined vaults rested, were, in magnificent buildings, columns of marble, granite or porphyry. When substructures were to be made in Rome and the neighbourhood, the trenches could be cut vertical with the help of light planking and strutting; the poling boards were put against the sides of the trench and uprights in front of them; a bed of mortar from 4 in. to 6 in. thick was then shovelled in, and on this was shovelled a course of broken stone about the same height, each stone not exceeding 3 in. or 4 in. in diameter, and these were rammed into the mortar until it appeared on the surface. Vitruvius (lib. 8, cap. 6) describes how the walls of rain-water tanks were made:—"In signine works these things are to be done: thus, in the first place, the purest and roughest sand is to be got; rough flints are to be broken not heavier than 1 lb.; let the strongest lime be mingled in the mortar, so that five parts of sand may answer to two of lime; let the matrix be added to the mortar; with this the trench, up to the future level of its height, must be rammed with iron-shod wooden rammers. From these rammed walls, the earth which is in the middle must be dug out to the level of the bottom of the walls; this only being levelled, is to be rammed to the thickness which has been decided on." This is the only account of rammed concrete I find in Vitruvius, but it was used as a filling to walls with thick stone facings. I may say here that no built scaffolding seems to have been used, except when the walls were enormously thick; rough putlogs were built through the walls projecting at each end for the scaffold boards, and sawn off flush, when the work was done. In the case of very thick walls or piers, where the putlogs only went in a short way, scaffoldings like our own must, I fancy, have been used, or else the putlogs must have been supported by gallows pieces.

Walls and piers were invariably built on the same principle, though the materials might be different, except in those cases only where, for appearance sake, the walls were of solid marble or hewn stone, or where quarries of good building-stone were at hand. I speak now of the ordinary methods; if the building was in a stone country, particularly where the stone was of small scantling, or of poor quality, the walls were of stone rubble, the facings being of small squared stones about 2 in. across, roughly worked, and tapering from the face inwards, and laid with one point of the square downwards, forming that network called *opus reticulatum* (see ink-photo illustration). The first process was to shovel on mortar, and, as each course of the neat facing was bedded by the mason, the interior was filled in by the hand of the labourers with a course of rubble,—*i.e.*, of broken stone in small pieces, or of chips,—all laid with the larger surface horizontal. Another bed was then made by shovelling in more mortar, and another course was then laid as before. At regular intervals, usually from 4 ft. to 5 ft., bond-courses, mostly of burnt brick, were carried through the wall (see ink-photo illustration). In the case of brick being the material used, and each being but from 1¼ in. to 1¾ in. thick (such as we call a tile), these tiles were of various sizes. Twelve-inch tiles were mostly used for facings in moderately thick walls; these were cut into four triangles, with the extreme points of the long side nipped off to make a better vertical joint, so that the tiles were usually about 11 in. long on the face without the joint, the long face of the brick triangle having its native skin on, being outside, so that, with the joints, about 4 ft. run of facing was made out of one 12-in. brick, and the inside of the wall, or filling, was treated in the same manner as the stone wall, only with brickbats instead of stones. About every 4 ft. 3 in. one course of bonders was carried through the wall. In thick walls the bond-tiles were about 2 Roman feet square. This system universally prevailed, even in 9-in. partition walls.

Vitruvius gives directions for making mortar (Lib. 2, cap. 5). He says, "If pit-sand be used, three parts of sand are mixed with one of lime; if river or sea sand, two of sand is to be thrown on one of lime," which, I may add, is much too fat and weak; for when the mortar is three or four to one it is nearly twice as strong as two to one; but, he adds:—"If a third part of pounded and sifted potsherd is added it will make the composition better for use," which is undoubtedly the case. He also recommends the use of pozzolana from Baiæ, or about Vesuvius, for waterwork. So, I suppose, the pozzolana of the Roman Campagna had not then been used. In speaking of *opus reticulatum* he says (Lib. 2, cap. 8):—"It is more beautiful than *opus incertum*, but apt to crack, because it has a bad bed and bond." And he recommends "the pieces of stone to be very small, so that the wall being full of mortar may last longer; for when the stones are soft and of little power, they dry it by sucking up the water from the mortar; but when there is abundance of mortar, the wall having more wet in it, does not so quickly perish" This is called the water of crystallisation, and if the bricks or stones be porous and unsoaked, the mortar perishes by the absorption of the water, and becomes mere dust. In brick house-walls of the last century this is often found to be the case; when the weight is off, the bricks can be lifted by the hand from their beds of mortar dust.

Arches were treated precisely in the same manner; the face was made of the usual tiles, only they were not triangular, but oblong, and from 6 in. to 8 in. deep. Whole tiles were used at intervals, and mostly 2 ft. square, forming the skeleton voussoirs of the arch, these being filled with the rubble in horizontal courses, in continuation of the abutments (see ink-photo illustration). In later times, in the case of arches in thick walls, the face of the intrados was kept some 3 in. within the upright of the piers, the centering of the arches being formed on turning-pieces with 2 ft. tiles, and over these another course of 8 in tiles, to break joint with those below. Not unfrequently tag-tiles were put in,—*i.e.*, tiles on edge,—to secure the outer face to the rubble; in some cases an extra piece of tile is laid flat against the tag-tile, to prevent its toppling over. In the heads of niches, and those large apses commonly called exedræ, the brick face was carried up to just below the angle of slipping, and then the double skin of flat tiles began.

From whom the Romans learnt this method, or whether they invented it, I do not know; but it was one of the greatest strides in the building art ever made. Very little teaching is wanted to mix mortar, if the proportions are known; and in walls from 6 to 20 ft. thick, where the facings are but 6 or 7 in. thick, the proportion of bricklayers to labourers need be but small, for any one can shovel on mortar or lay brickbats or stones, the big side downwards. So that no system was so convenient, where slaves were in great numbers, or where the work was to be done by soldiers or by the forced labour of peasants or herdsmen, particularly when enormous and permanent buildings were wanted in haste in places where skilled labour was scarce or precious.

Stone buildings may be pulled down stone by stone, as they were put up,—as we have lately seen done in the triumphal arch at Constitution-hill. The same is the case with old brickwork in England, particularly when the mortar had been made too fat and the bricks were dry, for when the roof is removed the bricks may be lifted out by the hand. Well-built modern London stock brickwork, with tolerably thick joints and good mortar, if the vertical joints are filled and the bricks have been soaked, is only to be cut through with a chisel or with wedges. Professor Middleton, who was in Rome during the destruction of some of the old rubble walling, says that dynamite was obliged to be employed to remove it. When I was in Rome I hoped to get the cracking strength of this rubble, but no experiments had been made, though doubtless the Italian Government will have this done.

By this invention the Roman architect was prepared to build in almost every locality, for brickbats, rough stone, stone chips, flints, lava, slag, and pebbles, were equally available, and one sort or another are mostly to be met with; nothing else was wanted but a few burnt bricks or some small roughly-cut stones for the facings, and some burnt bricks for bond. This facing, too, held up the comparatively soft filling without need of the boarding and uprights necessary for modern concrete, not that the architect's resources were even then exhausted. Viollet-le-Duc tells us that certain lintels of a stone-built monastery in France of the time of the Empire were made of concrete, as the native stone was not strong enough to bear the weight. The harbour of Marseilles and some of our sea-walls are built of huge stones made of concrete or mortar.

I may mention that in the time of Vitruvius the common material for buildings appears to have been sun-dried bricks. One of the aqueducts of Carthage, a drawing of which has been lent me by Mr. Alexander Graham, is built of huge blocks of mortar made of the native earth and lime.

One striking characteristic of the Romans was their impatience to occupy their buildings as soon as they had decided on having them; and this desire must have been greatly stimulated by military operations where ditches, mounds, walls, and forts, often of immense extent, had to be executed with the utmost rapidity. The Colosseum is said to have been completed in two years and nine months, and the Thermæ of Caracalla, including the enormous raised platform, in six years. Habits, too, learned in the camp must have been applied in Rome. In many cases barracks, theatres, amphitheatres, and baths, were wanted in the provinces, where little skill but that in the army could be found, and large bodies of unskilled labourers could be requisitioned. Timber had to be cut from neighbouring forests, and there was no time for seasoning. Besides the expense and delay, the shoring or supports for the centering must very rapidly have been useless from shrinkage and warping; the object, therefore, was to make the centering as light as possible, to do away with the shoring where practicable, and to let the green boards serve their end before they so shrunk and warped as to be useless. The observation that discovered that rubble walls could stand without bulging for 4 ft. or 5 ft. when protected by a thin skin of brickwork, and the ingenuity of making one brick go as far as four, was applied to the vaulting. One of the earliest devices was to cover the centering with a skeleton network of brick, that was perfectly rigid, as rapidly as possible, and to this end transverse rings of bricks, from 6 in. to 8 in. wide, and 2 ft. high, were turned 2 ft. from centre to centre, and about every 18 in. bricks 2 ft. square were built in as longitudinal ties, and the horizontal courses of rubble were filled into the coffers, which were about 18 in. square (see ink-photo illustration). As the courses of rubble were shallow, they soon set, and there was, too, considerable friction longitudinally against the upright sides of the brick arches, and the coffers were dovetailed transversely. Directly the lower courses had set, the upper part was carried by it, and there was no further weight on the centering.

There is, too, another consideration. If the centres were not rigid,—and practically none of wood can be so, unless the wood is well seasoned, and of excessive strength,—its giving would crack the solid mass of rubble, and to a great extent make it unsafe. Some of the arches of the aqueducts are made with this skeleton framing of brick. When people imitate, and persuade themselves that what they imitate is perfect, no improvement can take place; but as soon as they begin to think for themselves, improvement is almost

* Pliny's letter, Lib. 10, c. 16.

constant. The Romans thought they could do without the coffers, and so make the ribs further apart, keeping the 2-ft. tile, but putting it in the middle of the rib, so that about 8 in. projected on either side as a toothing, and this served to tie the rubble filling to the ribs. Another step was subsequently taken, which is to me utterly incomprehensible. About every 10 ft. a slice as it were of the former method was used, *i.e.*, two ribs only, about 12 in. apart in the clear, were connected with the 2-ft. tile, but without the toothings. This may be seen in the vaults of the aisle of the Basilica of Maxentius. Its only use, as far as I can see, was to keep the wood centering from rising up in the middle, as it was loaded on the haunches,—unless a skin of rubble was first put over the centering, though I did not notice this in the ruins. The arches through the buttresses to the nave vault of this Basilica were done in coffers, as in the former cases, *i.e.*, six-brick rings, with 2-ft. tiles connecting them for the skeleton voussoirs, making up their thickness of 10 ft. At the Temple of Jupiter, at Diocletian's Palace at Spalatro, the former method was adopted, only arches were used instead of the rectangular network. A succession of arches, 8 tiers in height, were built round the dome, above the large arches at the springing, and were afterwards filled in solid, with successive rings of smaller arches in brick, and a brick spandrel-piece to each, the cap of the dome being most probably of rubble. Robert Adam only shows a plain surface above the arches. This new departure was evidently a solution of the difficulty experienced with a dome, and is even more forcibly seen in a small one, and this dome is but 43 ft. 8 in. in diameter, for in the case of ribs, where these crossed or abutted at the top, they made a solid mass, and each of the horizontal bonding-tiles had to be cut, while arches could be turned smaller and smaller. Robert Adam took no trouble to ascertain if the cap was intersected with crossing-ribs, though it is quite possible there were none; as soon as the skeleton honeycomb was done, a thin course of rubble may have been put over the cap to keep it in shape.

Since writing this, I have read M. Choisy's "Art of Building among the Byzantines," and he says this arching was done to save all centering.

A new method was hit on long before the building of the Basilica of Maxentius, certainly as early as the Pantheon. At the Thermæ of Caracalla it is in full force for semicircular arches, the half-hemispheres of the exedræ, and the groined vaults. A course of 2-ft. tiles were laid flat on the centering, and over these another course of 8-in. tiles, and in every case the tiles of each course do not break joint with one another, but are laid in regular lines, like the squares on a chess-board, the small upper tiles, however, covering the joints of the lower large ones. It has been supposed that this inversion of the natural method was to save stuff and have only battens on the wood centres, 2 ft. from centre to centre, instead of continuous planking. The inner tile-skin was connected to the rubble by tiles here and there, built in edge-wise, that I have called tag-tiles.

Near Florence, in 1854, I saw a segmental vault so turned; I have lost my drawing, but, to the best of my recollection, it was only about 18 ft. span, and was turned with single tiles set in plaster of Paris, and there was no centering used, only turning-pieces, about 6 ft. apart from centre to centre, each tile being held in the bricklayer's hands till the joints had set; on this concrete was to be put, and a mosaic floor which had to be rammed; the haunches were stiffened by small vaults turned in the same fashion, and it was called Volterran vaulting. In the Roman vaulting with a tile-skin they first left out the middle tile of the upper course, *i.e.*, there were eight instead of nine tiles to the 2 ft. square; next they only put a line of the small tiles over the transverse joints; and eventually only one 8-in. tile at the junction of the four large tiles, and, in a few cases, they trusted to a single skin without cover-tiles, as in the Volterran vault I mentioned.

There was one very original application of single tiles in the vault of the newel staircase to the aisle roof of the Basilica of Maxentius. Two tiles were let into the walls at the bottom, and butted at the top, so as to make a triangle; this was made in steps, 2 ft. long for the head-way (see ink-photo illustration). The question we naturally ask ourselves is this,—In large spans, could this thin skin have supported the enormous weight of rubble without the arch being forced out of shape or the top courses being crushed? For it had nothing but its own rigidity to keep it in shape, and its own strength to resist the pressure.

Groined Vaults.

It is well known to the students of Roman architecture that the Romans avoided groining, when they could, by letting the intersection take place in the upright walls below the springing of the semicircular vaults; but in the case of large halls, as in the Thermæ and vaulted basilicas, to do this was to make the halls unduly high, and consequently unduly costly; and even in Rome, the fact of the windows being below the springing of the vault left a mass of gloom that was not agreeable. At St. George's Hall, Liverpool, the vault is invisible, except on very sunshiny days, or when lit up at night. In the Thermæ and vaulted basilicas, the aisles would have excluded light had not the groining permitted the opening of large windows, I merely mention this, as at present we are engaged on the construction of vaults, and not on the effects of lighting. The Romans tried to get the width of the interpenetrating vaults equal, and when the difference was slight they kept the crowns level and stilted the narrower one.

They also used this device, which may be seen in the plans of the Thermæ, where the halls were not square, or too long to be divided into a number of equal squares. The excess at each end was made into a simple semicircular vault, and this was of some service, as piers were thus got to resist the diagonal thrust of the groin points. There are, too, cases in which the groined bay is oolong, as in the end bays of the tepidarium of Diocletian's Baths.

The double tile centering was used in the groined vaults, as in the semicircular ones; only at the groin points, where the large tiles merely abutted, they were strengthened by the upper course at the junction, being of the 2-ft. tiles as in the lower course, only breaking joint with them, while the rest of the upper course was of 8 in. tiles. On this the diagonal ribs were formed, consisting of one centre rib and two side ones, connected with the 2-ft. tiles, only in this case the centre rib was square, and the other two were necessarily splayed, as well as the tiles connecting them, and this was done by rough cutting. In building these, one of the compound diagonal ribs was carried right over,—*i.e.*, making a complete arch,—and the other was scribed to it on both sides, which must have involved filling in the coffers with rubble at the junction before the general rubble was laid.

In vaults of large span, the vault arch (*arc doubleau*) was used, consisting of two rings joined by the 2-ft. tile; but in small vaults this arch vault was omitted.

Eventually, where the span was inconsiderable, the Roman architects used only a single brick arch for the diagonal ribs, with the projecting toothings, as mentioned in the case of semicircular vaults.

You will have gathered from what I have said that the system of groined vaulting called Gothic, even to what may be roughly called the flying buttress, had not only been invented, but brought to perfection by the Roman architects, some ten centuries before Gothic architecture began. The merit of the Gothic architects was to make an ornamental feature of what before had been hidden in the body of the work, and, by a system of balance, a stronger material, and a greater supply of skilled labour, to dispense with much of the substance that was necessary when the material was coarse, and when dead-weight only came into play.

You must observe that in one particular the Gothic scheme was founded upon another ideal, probably originating in the scantier means at the architect's disposal,—the Roman vault was roof and ceiling in one. If terraced, it was covered with mosaic; if inclined, with tiles or metal. In the Gothic, the vault was a ceiling only, except at Milan and a few other places, and the roof was a combustible one of wood, and by its weight helped to counteract the thrust of the vaulted ceiling. The rubble filling in vaults, when the span was great, as in the tepidarium of Caracalla's Thermæ, and for its solar cell, had pumice-stone for the matrix, but in those of smaller span merely tufa; and in all cases the courses of rubble were horizontal in arches, vaults, domes, or backings.

Before entering on those circular vaults we call domes, I must say a few words about Vitruvius. He knew of burnt bricks (though he mostly calls them *tegulæ*, or tiles, or *testæ*, earthenware, though in the piers of the suspentura he calls them *laterculi*, or little bricks), of arches, and even of the dome of the Laconicum; but he speaks of all these in the most cursory way. We cannot help asking ourselves how it was, when aqueducts had been built so long before, that arches were so little spoken of, and why nothing is said of the methods pursued in vaulting and doming, not to speak of centering.

At the very latest the dome of the Pantheon must have been done in Vitruvius's lifetime, and it cannot be supposed that all these devices suddenly sprang into existence. M. Choisy believes that all these devices were only begun in Agrippa's days. Count Nispi-Landi will have it that Lucius Cocceius Auctus built the Pantheon. I believe there is no doubt that he designed and superintended the tunnel at Posilipo, which is said to be half a mile long, and to have been done in fifteen days by the aid of 100,000 slaves. Was he the architect who first started the skeleton framework? And if so, where did he get the idea from? Until the illustrious Viollet-le-Duc wrote on Roman construction, and his celebrated pupil, M. Choisy, published his "Art of Building among the Romans," we knew nothing of Roman construction. Even Palladio did not take the trouble of seeing how the walls were built, for in his book of 1570 he shows the brick facing of oblong bricks, and not of triangular ones, though L. B. Alberti, in his book of 1565, shows the triangular brick facing, and neither Alberti, Serlio, nor Palladio seems to have known anything of the method pursued in arches, vaults, and domes. As yet we do not know the real dates of the constructions, so we cannot follow the improvements chronologically.

The Romans seem to have found that the pressure of the rubble squeezed the wood centerings of domes out of shape, so they began by putting ribs of brickwork round them to keep them in shape.

Although the dome of the Pantheon is not only the biggest built one in the world,—I mean by this without iron ribs,—but is supposed to be the earliest Roman one of any size, I will leave this to the last, and will take the one of Minerva Medica, which Professor Middleton believes to have been built in the reign of Gallienus, 253-268 A.D., and tells us was called the Terme di Galluccio in the Middle Ages. It is a decagon, about 80 feet in diameter, with nine semicircular recesses, and looks very like the laconicum of a bath. From each internal angle at the springing of the dome above the pendentives rises a compound rib, formed of five rings connected wth 2-ft. tiles: the upper part of the dome is destroyed, but at about one-third of its height from the springing, the angle rib is diminished to two bays. M. Choisy considers this to have been caused by a change of intention, but I am by no means sure of this, as it gave lateral stability when there was nothing but the skeleton framework. The upper story,—*i.e.*, above the semicircular recess,—was lit by a semicircular-headed window in each side. Taking one of the ten gussets of the dome, it was divided into three equal parts between the gusset-ribs by two single compound ribs. When these had got up to the height of the width between them, a 2-ft. semi-arch was turned. This compound rib was carried up to the level of the crown of the extrados of the arch. This certainly looks as if the original intention of carrying up two ribs had been abandoned, for if it were a simple skeleton, its only resisting power was the weight of the brickwork, and this was but very slightly out of the upright; but it looks as if it had been filled with rubble, as a centering for the arch, and then it would have acted as a weight to prevent the squeezing-out of the centering while the angle skeleton ribs were being built; and when the rubble was built this arch acted as a discharging-arch, and threw the weight of the upper part of the gusset on to the haunches of the clearstory windows. I may add that the shell of the dome was horizontally bonded with the usual bond tiles.

In the quarter-sphere heads of the niches on the ground-floor one single compound rib in the middle was found sufficient, and M. Choisy shows no tile skin to these, though this was found in the half-hemispheres in the wall of the Panthéon, as well as at Caracalla's baths.

Nothing was known of the method of doming the Panthéon until the days of Piranesi. In the

Middle Ages it was supposed to have been built on an earth mould in which coins had been thrown, so that the people might afterwards carry away the earth without payment. Giambattista Piranesi (1720-1778) was Pope Benedict XIV.'s architect (1740-58), and had to restore the internal stucco of the Cupola. In his work he gives the construction of the brick skeleton for keeping the centering in shape, and preventing pressure coming on the open parts of the substructure. Viollet-le-Duc wrongly supposed that Piranesi saw this brick framing on the outside; but he says, "as is seen when the ancient stucco was stript off"—*i.e.*, the inside.

In the first place, discharging-arches were carried round at the springing to get a bearing on the solid parts (see ink-photo illustration). These arches seem to be about 6 ft. on the face; the lower third of the arch on each side was bonded; the centre-pieces of each arch had first a 2-ft. ring, and above this, and on the skewback of the bonded part, there were stone springers with the two remaining 2-ft. rings bearing on them. From the crown of each spring the ribs of the eight gussets, going nearly up to the ring of the central eye; these ribs were capped with stone, the upper part of this being splayed on each side, to form skewbacks for flat arches, holding up the ring of the eye till the rubble was filled in. The first line of arches before mentioned, at the springing of the cupola, did not touch at the springing, but were filled in between by a solid cambered arch in four rings. From the top of this a single ring was superposed on the top of the first arches, one on each side, and supported the projecting angle of the stone skewbacks or springers, and half on these springers, and half on the backs of the first arches, sprang another semi-arch 6 ft. on face, also bonded at each springing for one-third up its length, with three rings for its centre. Between this arch and the gusset ribs there was an extra bit of ring running up a little on each side to wedge in the bottoms of the gusset ribs.

There now remain but two more brick features, first a semi-arch with no bearing, and a second ring parallel to that of the open eye, below the segmental arch, that supported the ring of the eye, and forming at the head of each gusset a "Vesica piscis." M. Choisy's solution of this part is as follows:—When the rubble was filled in to the line of the springing of the upper semi-arch, the upward pressure of the gusset-ribs imparted to the eye-ring by the segmental arches began to visibly distress the eye-ring; the architect consequently put in these semi-arches on the rubble, and by this means carried the inner ring, which thus took a part of the pressure communicated by the gusset-ribs. Both the long and the semi-circular chambers in the upper part of the wall have walls dividing them, with only a narrow doorway, so as to stiffen them where the pressure comes.

I strongly advise all the students who are French scholars to read the first part of the article "Vault," in Viollet-le-Duc's Dictionary and M. Choisy's works, for no man can be called an architect who is unable to construct, and, though iron now occupies the most important place in constructive problems, none of us can say that he may not be called upon to build in the old materials, which are but slightly affected by weather, and are so far fireproof that they can only be wantonly destroyed by fire when the building is not filled with combustible materials.

The reasons given for the skeleton framework of brick in the dome of the Pantheon are, of course, open to correction, but from the dome having stood for nineteen centuries entire we must conclude that it was wisely designed and well executed, and its very duration is a plea for a construction which may now be considered as too massive.

APPENDIX.

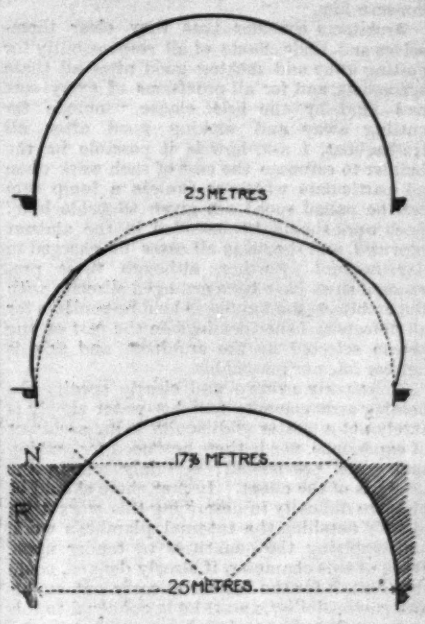
Extract from M. Choisy's Letter.

M. Auguste Choisy, the illustrious author of "The Art of Building amongst the Romans and Byzantines," who has brought to light the various expedients practised in forming the arches, vaults, and domes of these two epochs, the knowledge of which has been hidden from us for nearly two thousand years, was kind enough to send me a letter on the 2nd ult. in explanation of some points, which I think you will be pleased to hear:—

"I have only answered, aft full reflection, the questions you have done me the honour of asking on the subject of the Roman vaults.

First.—Can a vault in brick flat have sufficient strength to carry the main body of material when the span is from 20 to 25 mètres?

This is how I analyse the question. I imagine a vault in brick flat constructed on centres, and I try to strike them; evidently it will get out of shape and fall; but leave the centres and execute the haunches with the filling R,—up to



the level N the filling R will only exercise on the vault in brick flat an insignificant pressure.

It is after leaving the level N that the pressure of the filling begins. Quite insignificant at first, it increases little by little in proportion to its rise, but at the same time the effective opening of the portion of the vault in brick flat is already much reduced.

At the moment that the vault in brick flat begins to act, it has no longer the semicircular profile of a waggon-headed vault of from 20 to 25 mètres; it is a flat vault with a much smaller opening. It seems to me under these conditions to be strong enough.

Second.—Can arches about 3 mètres from centre to centre be substituted for centering to carry the weight of the filling?

I imagine, as before, the vault constructed, and, without leaving the mortar time to set, I attempt to strike the centres. What will happen?

It seems to me that the solid part between the brick ribs* will separate into two parts. One part, A, will form a vault, and carry its weight on to the ribs, T T. The other part, B, will detach itself, and inevitably fall.

I believe that the part B bears more or less completely on the centering, but that all the part A of the solid rests its weight upon the ribs, T T, and does not bear on the centering.

These views are expressed in my book at pages 53 and 61; but too briefly."

* See "Sketch from M. A. Choisy" on one of our ink-photo illustrations this week.

THE INCLUSION OF PROVISIONAL AMOUNTS IN CONTRACTS.

AT a meeting of the Institute of Builders, held at its offices, 31 and 32, Bedford-street, Strand, on the 5th inst., Mr. Thomas F. Rider in the chair, Mr. Joseph Randall (of the firm of Kirk & Randall) read a paper on the above subject, in the course of which he said:—

Papers have been so numerous upon almost every conceivable subject that one is at a loss to find anything new to discuss. It occurs to me that something may be said upon the question of provisional amounts and prime-cost items introduced so largely in quantities received by contractors for tendering purposes.

In the days when a master builder was employed for each trade, provisional amounts for structural ironwork, terra-cotta, hot-water services, bells, ornamental plastering, stoves, and chimneypieces, and all such matters, were unknown, much longer time being given for the carrying out of the work. But in the present age of rapid building, time is usually made the essence of the contract, and buildings are required to be erected in as many months as formerly years were allowed. Builders have now to sign stringent contracts containing heavy penalties for non-completion to time. It therefore becomes a very serious matter if they are not allowed the entire control of the works for which they are made responsible; and the introduction of so many provisional amounts does not give the contractor that control to which he is entitled, because of the entry of so many specialists, who all think they should be allowed to carry out their portion of the work when and as they please, and without regard to the requirements of the contractor.

For instance, a sum is specified in the bill of quantities for constructional ironwork, but no detail is given beyond the builder being required to unload and fix so many tons of ironwork. The price has been settled by the architect, and the builder has simply to give the selected person an order in writing so as to relieve the architect from monetary liability. This selected person is often most independent; indeed, were it not for the fact that he looks to the builder for payment, he could do without him altogether. He will, to a certain extent, do the work only when he pleases, causing delay in the completion of the building, and consequent loss to the contractor.

The reason for architects adopting this system is that they do not receive the rudimental education of an engineer, and therefore rely on the ironwork specialist to make the drawings for them. These should be made in the architect's office, so that builders, when tendering, might be in a position to see more fully the nature, description, and difficulties of the work to be undertaken. If this were done, and quantities of the ironwork taken out by the surveyor, there would be no need for making this work provisional, and the responsibility would then rest with the contractor to carry out his contract in a manner that would be most beneficial to all concerned.

It seems most unreasonable that the contractor should be held responsible, not only for giving the specialist accurate dimensions, but for the quality of the work, and time for completion as well, although his control is limited.

If these provisions are to be continued, the persons carrying out sub-contracts should be bound under conditions as regards penalties, time, system of execution, and mode of payment precisely similar to those under which the principal contractor is bound; and if the completion of the building is delayed by any default of the sub-contractors, the loss sustained should be borne by those in default, and a clause should be introduced in all contracts making the sub-contractors liable directly to the employer.

In cases of an urgent character, provisional amounts may be inevitable; and where this is so, the architect should make an agreement with an ironwork firm on the lines above indicated, stipulating particularly the mode of progress and time of delivery, which should in all cases be that best calculated to enable the whole of the work to proceed in proper order, and not, as some ironwork contractors appear to think, in such order and at such time as best suits their convenience. Indeed, sometimes so erratic are the deliveries of ironwork, that it would appear as if the builder intended to commence at the roof and work downwards.

The contractor has no claims upon the client, and cannot, as a rule, recover anything from the defaulting party; but, on the other hand, he has to suffer not only the pecuniary loss, but the stigma of being behind time with his contract. This might be prevented if architects made their own ironwork details, the builders being held responsible for carrying out this portion of the work.

Now as to terra-cotta forming a provisional item. The architect selects a particular firm to execute the terra-cotta, and arranges with them the price; the builder, after signing the contract, generally finds the terra-cotta manufacturer requires longer time to deliver the terra-cotta than is given to execute the whole work.

Instances could be given where from one cause or another terra-cotta that should have been delivered in six months did not arrive till twelve or eighteen months afterwards, the result being loss to the builder and intense dissatisfaction all round.

The case of terra-cotta is to some extent

complicated by the fact that working details to a shrinkage scale have to be drawn before the work can be put in hand, different makers having varying scales to suit their particular material; but this should be no excuse for the details not being at hand immediately the contract is signed. These details are generally the sole cause of trouble and delay. Some architects prefer to make their own; others say to the manufacturer, "Here are the drawings. You know better than I do what the nature of your material is; make the working drawings yourself, and submit for my approval." In some cases this course can be adopted, and where it can it is a common-sense thing to do. Builders should with caution undertake any contract where terra-cotta is largely used, unless ample time is given for its manufacture.

The builder in making his arrangements endeavours to bind the terra-cotta maker to time, mode of delivery, and all other stipulations necessary for carrying out the terms of the contract; but, unless he has all details ready, he is met with the remark "We can guarantee you no time of delivery until we are supplied with the whole of the details."

On whatever grounds architects may defend the non-preparation of all detail drawings before the contract is signed, it is absolutely imperative in the case of terra-cotta work that they should be ready.

For all such special work as terra-cotta the quantities should be taken out by the surveyor and included in the bills of quantities in the ordinary manner; and if the architect wishes for a particular terra-cotta manufacturer, and to personally make the agreement with him, he should bind him as to time and mode of delivery, and the time for completion, for a sum agreed, such times and dates in all cases to allow a fair margin of time for the builder to follow on with the completing trades. The terra-cotta manufacturer should be made party to the principal contract, and should sign the same as accepting all responsibility for his own work, and all drawings and details should be handed over to him by the architect at the signing of the contract.

The foregoing assumes that the architect is determined to make the terra cotta a provisional amount, but the best course, after all, is to treat it the same as he would treat stonework,—let the builder put his own price to it; let the architect, if he likes, have a sample for the builders to see when tendering, and let them make their own arrangements with the manufacturer direct; it is the shortest, simplest, and best method, and the one most calculated to work smoothly, and thus avoid the delay, unpleasantness, and extra expense often consequent upon the architect specifying one particular firm.

Should the architects themselves arrange with the manufacturer direct, builders should be not only exempt from the responsibility as to time or penalty, but the terra-cotta maker should be bound by the architect to make good any loss the builder sustains through his default.

After many years experience, I can only recollect one instance where the terra-cotta was supplied to the stipulated time.

With regard to gas, hot-water, bells, &c., for which generally provisional sums are included, and in most cases a firm or firms named to carry out the work, other sources of annoyance and delay occur, as generally the gasfitter chooses to do the work when it suits his own convenience, and when, perhaps, the plastering is started and the floors laid, causing endless cutting away and making good, and generally destroying the appearance of the other part of the work, as well as rendering it necessary to go over it a second, or even a third time.

If there are doubts about the position of the gas-pipes when the tenders are invited, approximate lengths of pipes should be given so as to form a schedule, leaving it to the builder to have the pipe-work arranged to suit the proper progression of the work, and it would only be necessary for the architect to indicate where the points should be, in which case the builder could fairly be held responsible for any negligence or defect that might arise.

The principles of gas-lighting are so well known that architects should be able to give sufficient detail in their specifications to enable the pipes to be laid without the aid of a specialist, and until architects clearly indicate in their specifications the position and description of the warming, lighting, and other similar work, surveyors cannot be held responsible for not taking out the quantities.

With regard to bells, it frequently happens that this work is done by another sub-contractor, who as a rule follows the course most suitable to himself, without regard to the exigencies of the builder. Whether it delays or destroys his work, or whether he has to make additional outlay for taking up boards or cutting away, this is of no moment to the bellhanger; the cutting away and making good is not included in his contract, and he cares not who pays for it—that is a matter which does not concern him.

Architects consider that they clear themselves and their clients of all responsibility for cutting away and making good after all these specialists, and for all provisions of every sort and kind, by the brief clause, "include for cutting away and making good after all trades," but, I ask, how is it possible for the builder to estimate the cost of such work when no particulars whatever (unless a lump sum can be called such) are given to guide him? Such work should be included in the amount provided, and should in all cases be charged in day account. Further, although these provisional sums have been arranged directly with the architect, the builder is held responsible for all defects and shortcomings on the part of the person selected by the architect, and this is neither fair nor reasonable.

To properly arrange and clearly specify the heating arrangements and hot-water supply is surely not a matter of difficulty to an architect of experience, nor is there any need for making such work provisional; certainly not in the interests of the client. In fact, there should be no more difficulty in describing this work than in fully detailing the internal plumber's work, and supplying the quantities to tender upon. Work of this character, if clearly defined, could then be left for the builder to carry out on his own responsibility, and if he is not equal to this he is not fit to be employed.

There are many other provisional items included in contracts that it would be easy to avoid if a proper description were given to enable the surveyor to take out the quantities the same as he does for other parts of the work, leaving the builder free both as to the prices at which he estimates the value of the work, and the manner and time of doing it. And he would then be able to organise the various branches so that trade may follow trade in a systematic manner, and thus avoid the trouble, anxiety, loss and expense he otherwise inevitably incurs, and for which he receives no recompense.

Another view of the subject meriting a passing notice is as to certain goods being specified to be obtained from certain persons, who, as a rule, when they know they are specified, obtain an advantage in price; in fact, it is an inducement for merchants to charge a higher rate, and is therefore unfair to both client and builder.

This practice of specifying particular persons,—which gives them what is practically a monopoly,—could, and should, be avoided by adding the words "or other approved firm," thereby giving the builder some latitude, while preventing unfair advantage being taken.

There are items such as stoves, chimney-pieces, and ironmongery, which are specified to be selected at prime-cost prices. Provisions of this description may, to a certain extent, be necessary for the client's or architect's convenience in selection, but here the builder is met with a clause in the specification such as, "All values quoted as prime-cost are exclusive of profit, packing, carriage, and fixing, and any other customary charges, for which the contractor must allow, and to be so deducted in case of omission." It is manifest that in many cases the builder is unable to make a proper allowance to cover such contingencies, when he is unable to know where the architect is likely to select these goods, and what the maker's charges may be for packing, carriage, and other incidental items, which are made after the architect has obtained the lowest possible prices. If the builder makes any demur, he is told that he should have made proper allowance in his estimate; whereas, in most cases it is impossible to accurately, or even approximately, estimate these additional charges.

Another ambiguous item is frequently met with, for instance, tile pavings at a certain prime cost at manufactory. The builder is to include for carriage, profit, packages, and laying; but it frequently happens that the builder may estimate 2s. 6d. or thereabouts for laying what he may, from the sum provided, naturally consider a plain paving, whereas the architect may select an elaborate paving in small pieces, the cost of laying which may be three or four times what the builder anticipated. The proper rule in these and similar cases is that the prime cost price should include all charges as well as laying or fixing, leaving the builder to put in his own profit.

Although the prevailing method of introducing considerably more provisional sums in contracts than are absolutely necessary may save the architect much trouble, it should be the architect's duty to his client, and greatly to the builder's advantage, if such details were given that he might apply his own price and be left to carry out the work.

At present these provisional amounts average from 25 to 40 per cent. of the contract amount, and in many cases the builder is simply left with the excavation, concrete, and brickwork, mason's work, carpenter and joiner's work, and the painting, nearly all the other work being set forth to be done by other tradesmen. If builders are to be held strictly to contracts they should be permitted to carry out the whole of the work, and to enable this to be done, they should have a voice in selecting the person to carry out the provisions, so as to ensure the builders having proper control. And further, where sub-contractors are directed, upon the instructions of the architect, to carry out portions of a contract, and fail to fulfil their undertaking, the client should be held responsible to the builder for such default.

OBITUARY.

Death of Captain Ericsson.—The Nestor of the profession of civil engineering died on March 8 at New York, aged 86. John Ericsson was born on July 31, 1803, at Langbanshyttan, Wermland, Sweden, where his father owned some mines. He entered the Swedish Army in 1822 as a lieutenant of Engineers, and rose to the rank of captain, but left the service, and devoted himself to civil engineering. In 1827 he went to England, and in 1829 took part in the engine competition in which George Stephenson's locomotive, "Rocket," obtained the first prize, Captain Ericsson's engine, "Novelty," being second. In 1833 he first brought to public notice his caloric engine. In 1837 he constructed the *Francis P. Ogden*, the first vessel worked by the screw-propeller. Finding that he could get no support for his propeller from the English Admiralty, he left for America, and during the next few years had the satisfaction of seeing the screw-propeller adopted by the navies of the world. The first war vessel he built in America was the *Princeton*, which was also the first steamship which had her machinery protected from shot by being placed below the water-line. The story of the *Monitor*, which made such short work of the formidable Confederate vessel, the *Merrimac*, and which he constructed in the short space of three months, is too well known to need more than a reference. During the later years of his life, Ericsson was engaged in perfecting his system of submarine torpedo-boat, the outcome being the *Destroyer*. It is a remarkable illustration of the genius of the man that he never saw that vessel, working and giving his directions by drawings. The latest invention of the deceased was his solar-engine or sun-motor, in which the rays of the sun are directly utilised in generating steam for operating engines. He also gave to the world the steam fire-engine, and his other inventions are numerous.

Greek Mouldings Illustration Fund.—Mr. Penrose has received the following further subscriptions towards this fund:—

Mr. B. T. Batsford	£1	1	0
Mr. H. Stannus	2	2	0
Mr. Arthur Cates	2	2	0

We may call the attention of our readers to a letter on the subject from Mr. Penrose, in another column.

Sewage Purification.—On Wednesday last Mr. Charles H. Beloe, M.Inst.C.E., delivered a lecture at the School of Military Engineering at Chatham, to the officers of the Royal Engineers, on the purification of water and sewage by the magnetic spongy carbon process introduced by the International Water and Sewage Purification Company, Limited, of London. The lecture was illustrated by diagrams and samples of the materials used, and of the results obtained by this process.

Hall at Lower Brandon, James River, Virginia.—Eighteenth Century.

HALL AT LOWER BRANDON, VIRGINIA.

THIS is an interior from one of what are called the "Old Colonial" houses of the United States; English eighteenth-century domestic architecture, repeated on American soil.

ANCIENT SCULPTURE IN BRONZE:

RELIEFS.

MR. A. S. MURRAY, Keeper of the Greek and Roman Antiquities in the British Museum, delivered his second* lecture on "Ancient Sculpture in Bronze" to the students of the Royal Academy on the 21st ult. This lecture was devoted to the subject of reliefs.

The lecturer, at the outset, said that the Greeks, like many people nowadays, were a little vague as to the nature of bronze: they made no clear distinction between bronze and copper. One word served for both, and a consequence of that was that when we tried to trace back to its beginning in Greece the process of mixing copper with a small alloy of tin and some other minute ingredients so as to produce bronze, we were stopped at the threshold by that ambiguous word χαλκός. There was every reason to believe that bronze, in the true sense, was known as far back as the time of Homer, but there was no positive proof, for the reason just mentioned. Our information as to the composition of ancient bronzes was derived from analyses that had been made in modern times. Although Pliny gave us certain statements (xxxiv., 6–9), they were useless when he mentioned details, and only amusing where he reported that the alloy which made the Corinthian bronze so famous had been discovered at the sack of Corinth by the Romans under Mummius, when vessels of gold, silver, and bronze melted together in the conflagration, and produced a golden bronze. That was in 146 B.C., but the charms of the gold-like Corinthian bronze had been known long before. Nevertheless, the story, though of late origin, might have been based on a tradition as to the use of gold as an alloy of bronze, because from several specimens of ancient bronzes that had been analysed, it had been found that gold and silver were actually employed. An archaic fibula yielded 7 per cent. of gold, 20 per cent. of silver, and 73 per cent. of copper. A peculiarity of bronze which was early discovered was that it readily allowed itself to be beaten. The more it was beaten, the more useful it became. Bronze hammered out into thin plates was of endless utility. Primitive people, who wanted a bronze vase and could not yet make one all of one piece, took several thin plates, bent them, cut them, and fastened them together with rivets or nails, and so produced the required vase. With such thin plates of bronze they decorated the walls of their palaces, the tombs of illustrious persons, their temples, and their household furniture. When the bronze had been beaten out into long thin slips or bands, the next step was to enrich those bands with reliefs. The usual process seemed to have been to hammer the metal down into a mould of some hard substance. There was in the British Museum an archaic bronze vase on which was

* For illustrated report of the first lecture, on "Incised Designs," see *Builder*, p. 148, *ante*.

a long row of figures of Medusa, each of which had been beaten out from one and the same mould. In that instance, the whole of the work was done by beating down from the back. Nor were the outlines revised and corrected by incised lines, as was often the case in very early art. The best and one of the oldest representations of the process was to be seen in the bronze plates which had adorned a gate erected at a place called Balawat, by Shalmaneser II., a King of Assyria, in the ninth century B.C. These bronze plates were now to be seen in the British Museum. They had been fastened on with nails to a background of wood in long parallel bands. The object of the artist was to commemorate a long series of victories and conquests by Shalmaneser, and to students of ancient art these reliefs were interesting because they afforded evidence that the idea of working in relief originated in the experience that bronze could only be beaten up to a certain extent, equivalent to what we now called "bas-relief." There was no great attraction in these Balawat reliefs from an artistic point of view, but they were of much historical interest in regard to the position which they occupied with reference to the subsequent art of Greece. In passing from these works of the Assyrians to those of Greece, we must not forget the intermediate stage of the Phœnicians, especially the Phœnicians who were settled in the Island of Cyprus. From Assyria to Cyprus was an easy step about 700 B.C. At that date the Assyrian power was predominant in the island. Cyprus, with its rich copper-mines, and its skill in bronze-work, was a possession which the Assyrians fought long and hard to retain. But what interested us in the matter was the direct influence which the Assyrian art of the seventh century B.C. exercised on the Phœnician workmen in Cyprus. Of late years much evidence had been obtained from excavations,—evidence which always went to show that the Phœnicians had been constantly indebted to the Assyrians for conceptions and designs, for what might be called the motive-power of their art. They brought the technical skill themselves, and were industrious to the highest degree in metal-working. They commanded the markets for articles in bronze, and one of these markets was Greece. That was the state of things in the seventh century B.C. It should be remembered to how great an extent bronze must have entered into the circumstances of daily life among the Greeks of that date. To say nothing of the legendary palaces of Menelaos and Alcinous, with their walls glittering in bronze, the interior of a house described by the poet Hipponax in the sixth century B.C. was spoken of as hung all round with shining bronze armour, weapons, and vases. Tombs were incomplete without the same: one had only to recall the number of bronze swords and spears from the tombs of Mycenæ and Ialyssos. Temples were storehouses of trophies in bronze. In the decoration of armour, furniture, vases, tripods, and other things, there were continual opportunities for the use of bronze sculpture in relief. Compared with the extent of its use, however, we had not much actual remains of the kind from Greece. Bronze was too useful to the conquerors of Greece, and its only safety was in the tombs, and not always even there. Houses and their contents had vanished, so that we scarcely knew what an ancient Greek house was like. Temples had been overthrown and stripped, and public buildings of every kind had been reduced to their foundations, if even they had been preserved so far in all cases. But it sometimes happened that an insignificant fragment, when looked at in the light of some passage in an ancient author, revealed the general character of an artist who had been famous in the early times of Greek art. In that manner, though the artistic remains were meagre and the literary records not very extensive, we could nevertheless manage to obtain a reasonable conception of the skill and activity of the early artists of Greece, especially in the matter of bronze reliefs. But we must take the Etruscans also into account. To illustrate the ordinary Etruscan work of about 600 B.C. we had the reliefs attached to a bronze bust, now in the British Museum, found in a tomb at Vulci with many other antiquities, but in particular with a porcelain scarab bearing the name of the Egyptian King Psammetichos I., who died in 612 B.C., the whole contents of the tomb taken together pointing to the end of the seventh century B.C., but indicating no intercourse with Corinth or any other part of Greece proper; they indicated rather an intercourse with the Greek settlers in Egypt, to whom Psammetichos owed so much. The bust, therefore, might be taken roundly at 600 B.C., and might be regarded as an average piece of work. Of course, much was not to be expected at that time, when as yet the mere technical processes of working in bronze were only being learned. Casting was unknown, as could be seen from the bust itself, which was made up of a number of plates beaten out into the required forms, and fastened together with small nails. If there had been before then some experience in making reliefs, that experience had been checked and controlled by the designs that were being daily imported from abroad. The Etruscan workman was compelled by fashion to go on copying the foreign designs that found favour with his countrymen. It was extremely unfortunate for him, because there was plenty of evidence, even in his copying, that he possessed the power of imparting a strong if sometimes rude realisation to his designs. The reliefs on the Etruscan bust referred to, consisting of rows of animals and chariots, might not be beautiful or attractive, but from their well-ascertained date they might be useful in a humble way in tracing the connexion between the long bands of Assyrian reliefs from Balawat, and the first efforts of the Greeks and Etruscans to do something of the same kind for themselves. The lecturer said he referred to the reliefs on the bust because they were most easily accessible, but a number of fragments nearly similar in style had been found at Olympia. These, however, would hardly have served his purpose better, which was to show what was being done by ordinary workmen at a time when we had records of works of a similar kind by known sculptors, *i.e.*, about 600 B.C. On the Acropolis of Sparta there was to be seen, as late as the second century A.D., a temple to Athene, containing a bronze statue of her, and having, as was generally understood, its inner walls plated with bronze. The statue was by Gitiadas, a local sculptor, who was also known as a poet. By him also were a number of subjects in relief, which it was often supposed were distributed on the plates of bronze that encircled the walls, but, unfortunately, the description given by Pausanias was very meagre. Another sculptor celebrated for his works in relief about the beginning of the sixth century B.C. was Bathycles, who made the throne of Apollo at Amyclæ. We should find it a difficult journey now from Magnesia in Asia Minor to Amyclæ in Greece, but Bathycles made that journey, taking with him his workmen and assistants. The lecturer said he did not mention that as being anything unusual, because nothing was more common than to find Greek artists executing extensive works far away from their homes. He referred to it only as a contrast to the great Italian schools, which were often localised as if communication with the outer world hardly existed. Bathycles arrived with his workmen, and, when the task was nearly completed, means were taken to perpetuate the personal appearance of these same workmen, under the form of a chorus on the uppermost band of reliefs on the throne. That was an ancient manner of celebrating the completion of a great work. It answered to our public dinners, with the difference that the Magnesian workmen and assistants were no worse the next day. During the sixth century B.C., as far as we could judge, there was not much done in the way of reliefs in bronze. That was an age of colour. Sculpture in marble, fresco painting, and vase painting had started on a new life. Even the sculpture in marble was brightly coloured. Reliefs in bronze could not compete in the taste of the day with mural paintings or the innumerable painted vases, and so, while these arts were making great strides, and winning public favour on all hands, reliefs in bronze were in a great measure set aside. During the fifth century B.C. the arts of Greece were at their highest, but of that period we had nothing left to us in the shape of bronze reliefs. Very possibly the sculptors avoided them. Still, it must be assumed that the art had not been lost sight of, because in the next century we found the art in full operation, with what appeared to be very distinct traces of the large ideal manner of the past age. The relief on the outside of a bronze mirror case lately acquired by the Museum (which was referred to in the last lecture) consists of a group representing a love scene of some kind,—possibly it represented the story of Phædra and her love for her stepson, Hippolytos. The composition of the group had no trace in it of the formality, balance, and responsion of one figure to another which characterised archaic art, still less the bending, stooping, and contorting of the figures to adapt them to a circular surface. It was difficult to describe its beauties except by appealing to the largeness of style in the forms, the excellent rendering of the draperies, and the conception of Eros as an accessory figure in the design. Passing over a number of bronzes of this class in the British Museum, the lecturer noticed the bronzes of Siris, the name which for many years had attached to the bronze reliefs said to have been found near the River Siris, in Southern Italy, in 1820, and acquired by a quasi-public subscription in 1833. Each of the two groups represented the same subject, a Greek overpowering an Amazon in battle. Of these bronzes Thorwaldsen said that "they afforded the strongest possible proof of this truth,—that the grandiose does not consist in mere mass, since these diminutive works are truly great, while many of the modern colossal figures are, notwithstanding their dimensions, petty and mean." From a technical point of view, these bronzes were no less than marvellous as examples of *repoussé* work. The quality of the bronze must have been originally fine beyond all praise or comparison to admit of being hammered up to the extraordinary extent which it reached in the chests and faces of the Greeks. If they were not actually by Lysippos, they might fairly be claimed as being largely influenced by his manner.

We hold over until next week our report of Mr. Murray's third and concluding lecture.

Illustrations.

NOTRE DAME, PARIS.

THIS is a view of Notre Dame by Mr. C. E. Mallows, showing it as it may have appeared with the spires which are now wanting.

The spires are restored after a plate in Viollet-le-Duc's lectures.

PITCHFORD HALL.

THIS very curious and interesting example of the half-timbered houses of the time of Henry VIII. is situate in the Hundred of Condover, and about six miles south of Shrewsbury.

The earliest possessors of Pitchford of of whom we find mention were a family who derived their name from the place; of whom one Ralph de Pitchford, says Camden, "behaved himself so valiantly at the siege of Bridgnorth, that King Henry I. gave him Little Brug near it, to hold by the service of finding dry wood for the Great Chamber of the castle of Brug, or Bruggnorth, against the coming of his sovereign lord the King."

The hall is now the property and residence of Colonel Cotes, to whom it came through his grandfather, the Earl of Liverpool, from the Ottley family, who had the estate for nearly four centuries. William Ottley, Esq., was high-sheriff for the County of Salop in the 15th of Henry VII., and again in the 5th of Henry VIII., in whose reign the present hall is supposed to have been built.

Various alterations have been made with the object of restoring some parts of the original arrangement, and making existing and comparatively modern work more in harmony with the old. Some of the rooms have been panelled throughout in oak from the designs and under the direction of Messrs. Williams, West, and Slade.

DETAILS OF ROMAN CONSTRUCTION.

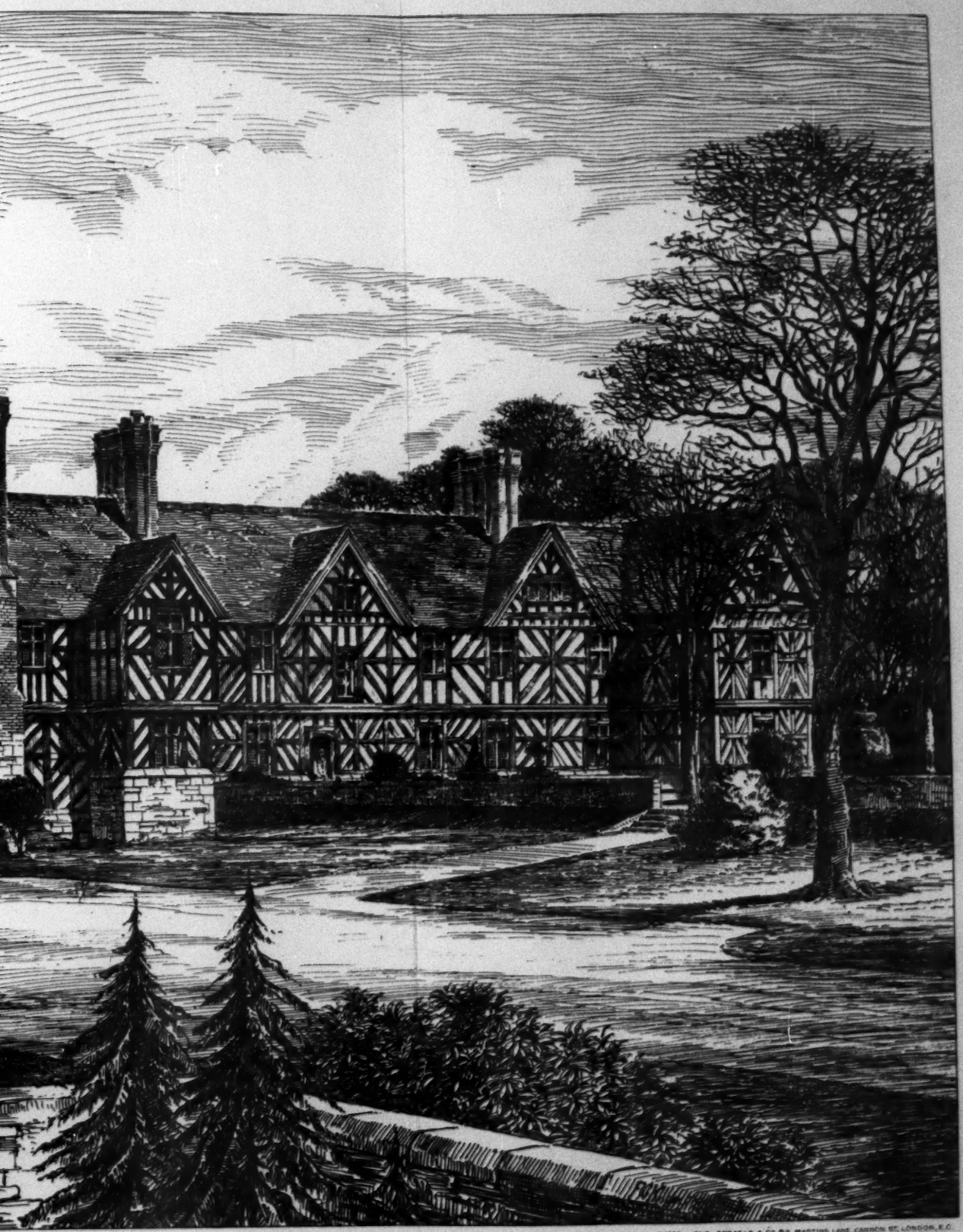
THE two pages of details of Roman construction contain reproductions of several of the diagrams used by Professor Aitchison, A.R.A., in his recent course of lectures at the Royal Academy. We publish the sixth and last of these lectures to-day, and in it and the preceding lectures will be found references to the diagrams now given.

ROMAN MOSAIC DECORATION.

THESE illustrations are from the diagrams to Professor Aitchison's lectures on Roman architecture. The upper one, as noted on the plate,

PHOTO-LITHO. SPRAGUE & Co 92, MARTINS LANE, CANNON ST, LONDON, E.C.

PITCHFORD HALL, SHREWSBURY.—With Modern Additions by



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NS BY MESSRS. WILLIAMS, WEST & SLADE, ARCHITECTS.

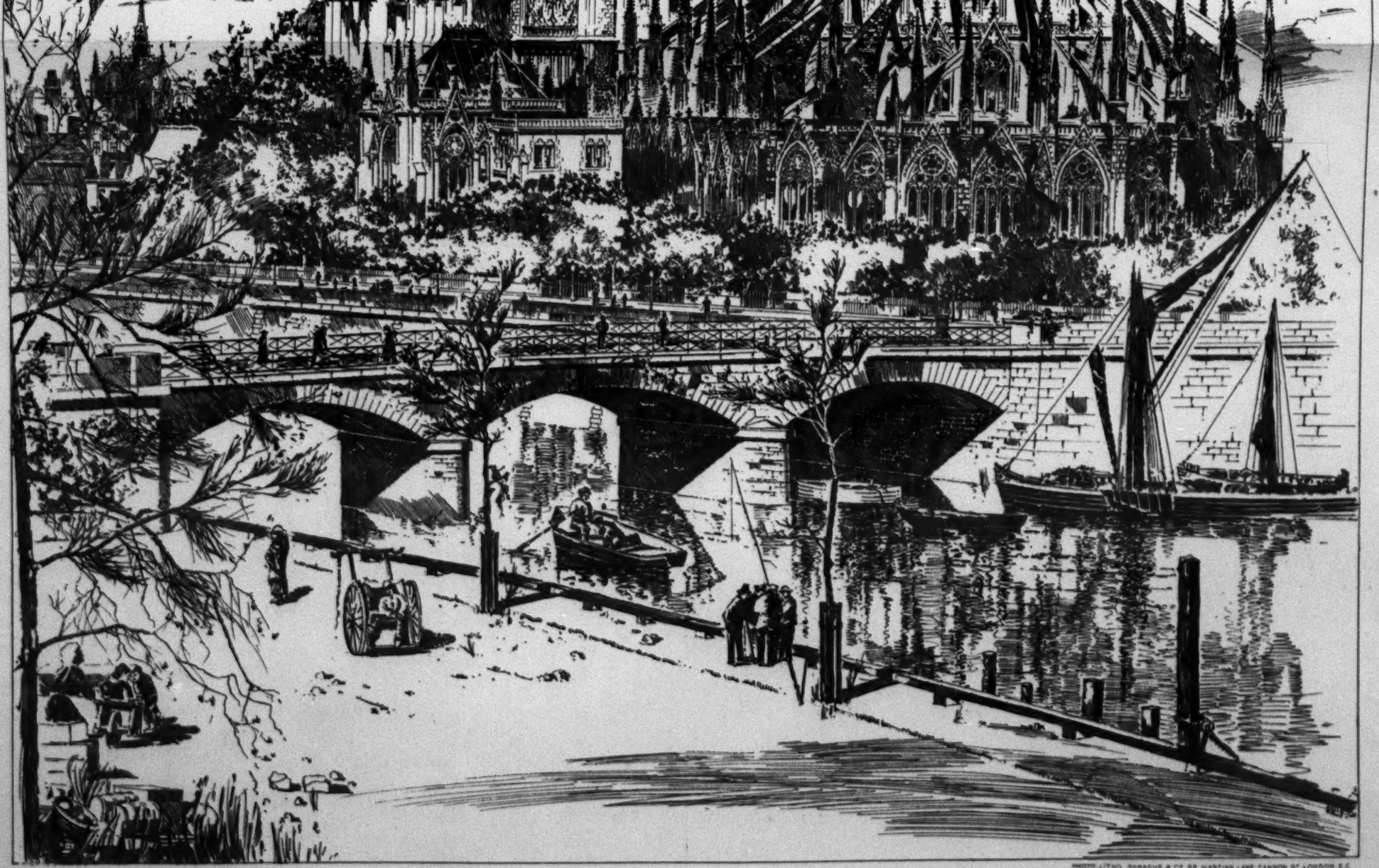
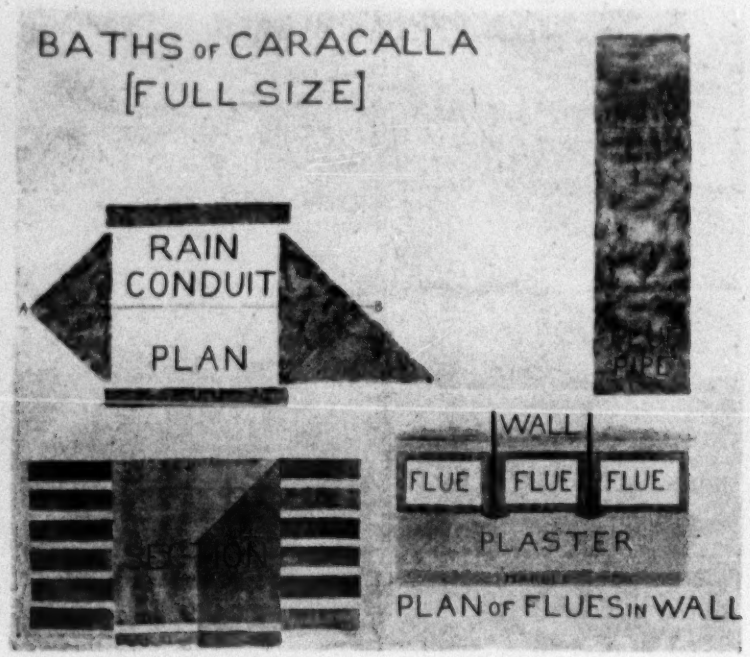
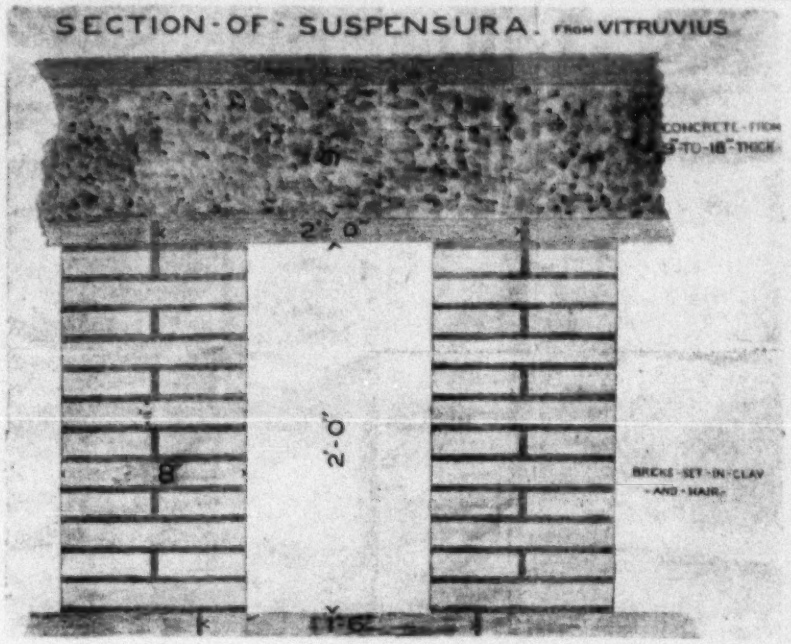
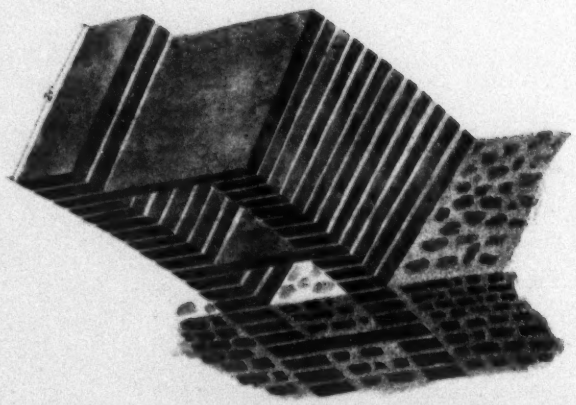


PHOTO-LITHO. SPRAGUE & Co 52, MARTINS LANE, CANNON ST, LONDON, E.C.

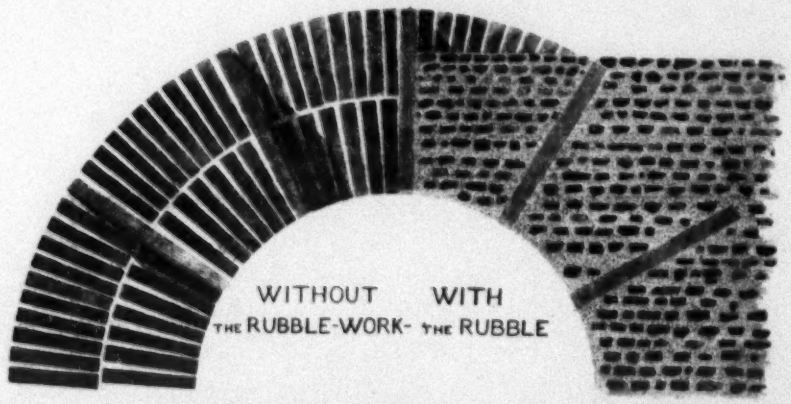
NOTRE DAME, PARIS: WITH SPIRES RESTORED AFTER VIOLLET-LE-DUC.—From a Drawing by Mr. C. E. Mallows.







BRICK-RIB OF ROMAN VAULT



ROMAN ARCH BACK ELEVATION

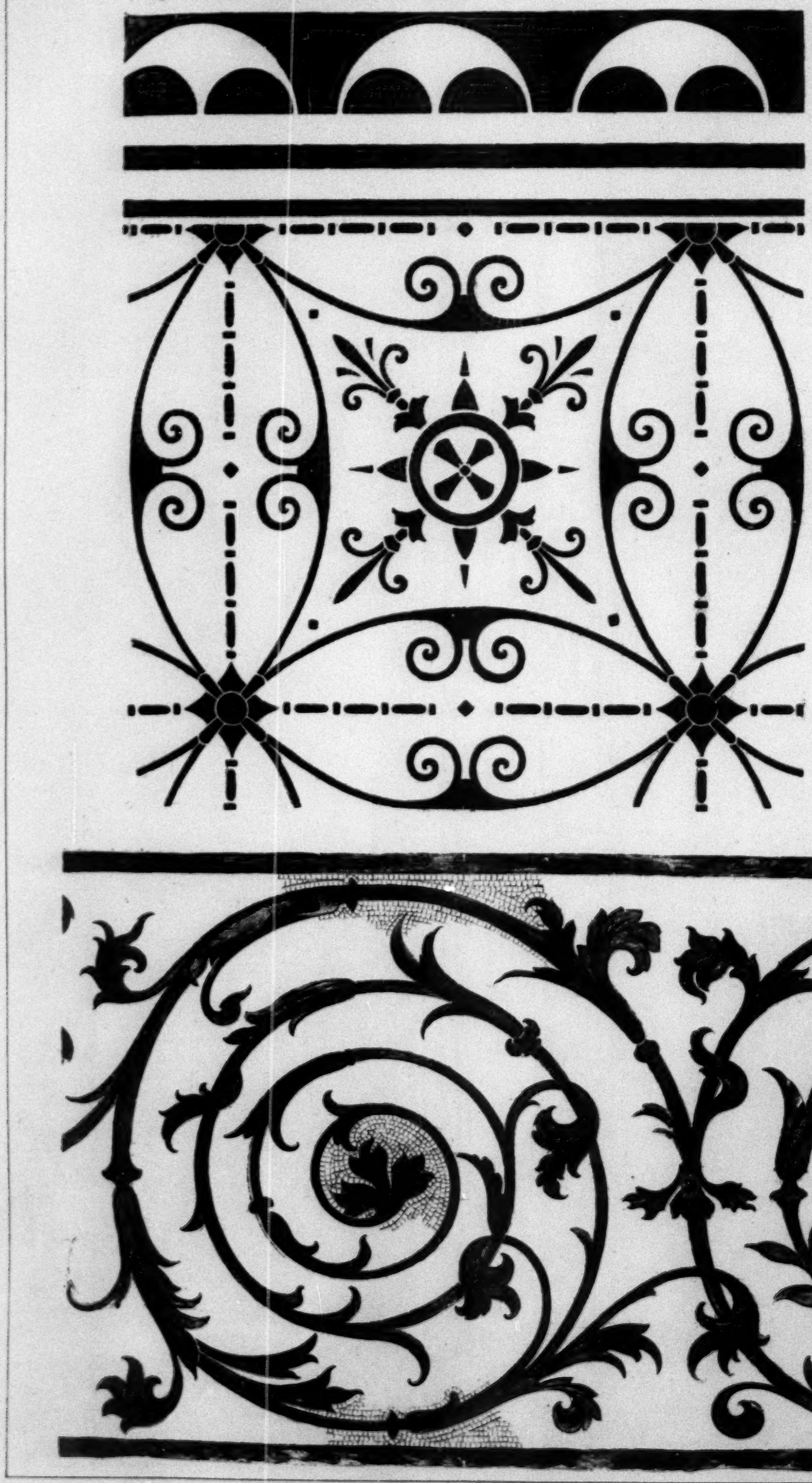
THE PHOTO. SYNDICATE 82 ST. MARTINS LANE, CANNON ST. LONDON E.C.

DETAILS OF ROMAN CONSTRUCTION.

DIAGRAMS IN ILLUSTRATION OF PROFESSOR AITCHISON'S ROYAL ACADEMY LECTURES.

DIAGRAMS IN ILLUSTRATION OF PROFESSOR AITCHISON'S ROYAL ACADEMY LECTURES.

-HADRIAN'S-VILLA-

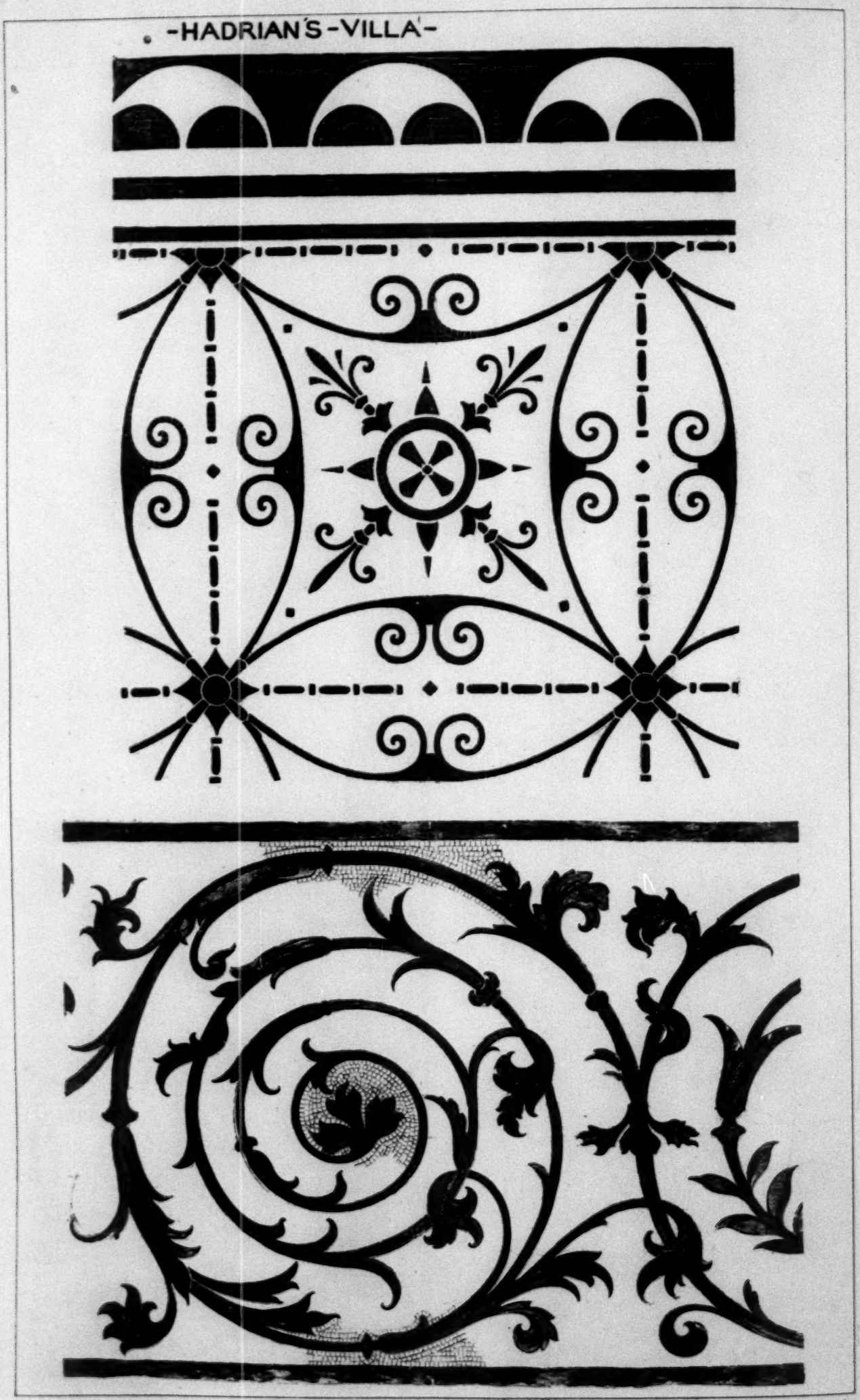


[Ink photo: Spragle & Co. 42 Hatton Gar... London E.C.]

ROMAN MOSAIC DECORATION.

DIAGRAMS IN ILLUSTRATION OF PROFESSOR AITCHISON'S ROYAL ACADEMY LECTURES.

NEW TOWER OF THE CHURCH OF ST. PATRICK, COLERAINE.—Mr. Thos. Drew, R.H.A., Architect.



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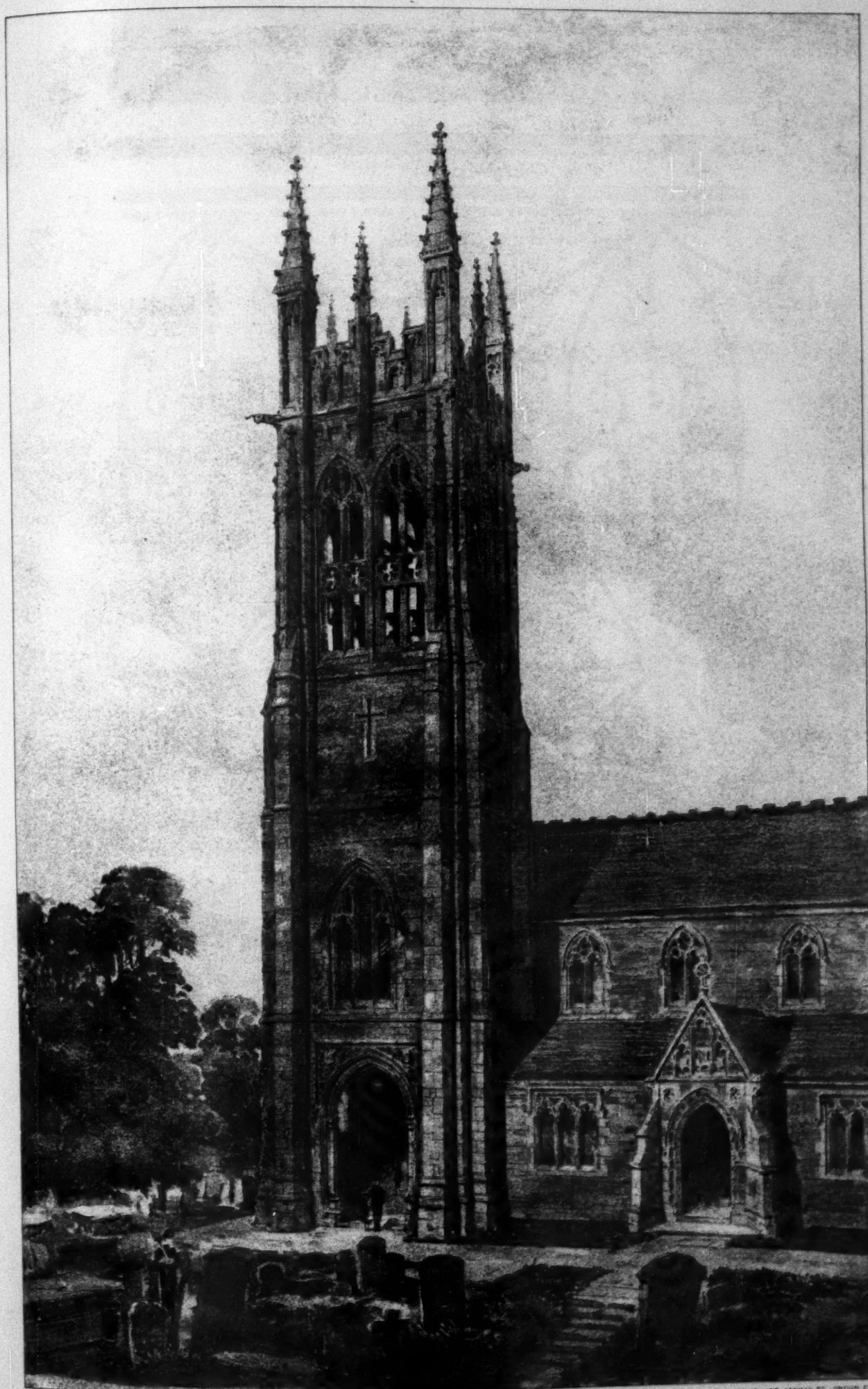
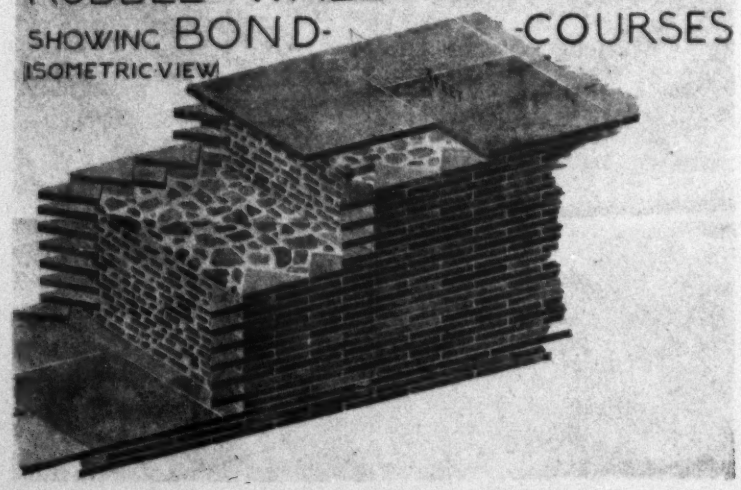


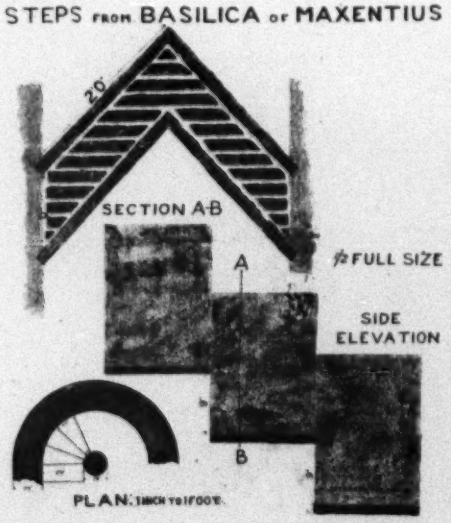
NEW TOWER OF THE CHURCH OF ST. PATRICK, COLERAINE.—Mr. Thos. Drew, R.H.A., Architect.

RUBBLE-WALL FACED WITH BRICK SHOWING BOND-COURSES

ISOMETRIC VIEW.



STEPS FROM BASILICA OF MAXENTIUS

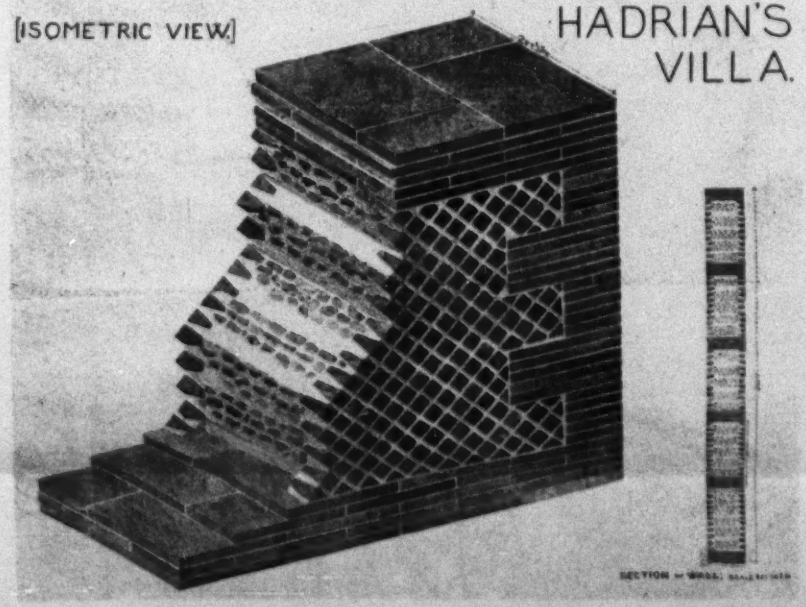


FRAMEWK OF DOME OF PANTHEON.

ACCORDING TO PIRANESI

WALL OF OPUS RETICULATUM AT HADRIAN'S VILLA.

[ISOMETRIC VIEW.]



DETAILS OF ROMAN CONSTRUCTION.

DIAGRAMS IN ILLUSTRATION OF PROFESSOR AITCHISON'S ROYAL ACADEMY LECTURES.

is from Hadrian's Villa; the lower one is from the pavement in the peristyle of the Gymnasium in the Thermæ of Caracalla.

TOWER OF ST. PATRICK, COLERAINE.

THE present church at Coleraine was built in 1614, but the existence of a church on the site dates from an ancient period. It is supposed that this was done by repairing or rebuilding the walls on a part of the old foundation, and putting over them a substantial and massive roof of oak, part of which remained in fair condition until taken down last year. Only so much of the existing walls and foundations were then utilised as would meet the requirements of the scanty inhabitants of the town, and old foundations still remain extending to the full breadth of the church for some 40 ft. beyond the east wall of the building then erected. In the year 1719 a tower, surmounted by a wooden spire, which was subsequently struck by lightning and removed, was built by the Irish Society. Other additions were from time to time made to the building thus erected. A south transept was added by the Corporation in 1784; a south aisle and a small chancel in 1851; a north transept in 1862; and a vestry-room, organ-chamber, and other improvements as late as 1875. The general result of these additions was to supply a building sufficient for the wants of the parishioners. Of late years, however, time and decay began to make their effects very visible, the roof and walls took in damp in many places; the timber in the tower became decayed, while the accounts rendered by the churchwardens showed an annually increasing expenditure for indispensable repairs. Under these circumstances, the rector and vestry considered that their wisest course would be to consult a competent architect, with a view to having their church sufficiently enlarged to enable it to accommodate a congregation of 800, and at the same time to have its structure permanently improved.

Accordingly, the services of Mr. Drew, R.H.A., were secured; and he advised the re-casting of the whole plan of the church, and its virtual rebuilding, retaining only, as far as it was possible to trace them, the old lines of the ancient structure. The tower of 1719, which, besides being in a bad and even dangerous condition, never was distinguished for beauty, was condemned and pulled down, and a new one has been built in a rather different position, so as to give room for lengthening the nave, and thus increasing the accommodation of the church. It is this new tower which is shown in our illustration.

The cost of the whole work has been about 6,000*l.*, of which the tower cost 2,200*l.*

FREE LECTURES TO ARTISANS AT CARPENTERS' HALL:

THE VENTILATION OF BUILDINGS THROUGH THEIR WALLS.

THE fourth* of the present series of free lectures on subjects connected with building, under the auspices of the Carpenters' Company, was delivered by Professor W. Ramsay, Ph.D., F.R.S., on Wednesday evening, the 27th ult., before a large audience. Mr. J. T. Preston, Past Master of the Company, presided.

Professor Ramsay said that the subject of his lecture was "The Ventilation of Buildings through their Walls." There were doubtless many present who had studied ventilation well, and were able to tell its difficulties, and to conquer them. He had not, therefore, come to advocate any new system, but it occurred to him that it might interest those who interested themselves in building if he were to give them some first principles with regard to the subject, the object of ventilation, and the means of ventilation. In the first place, Why should they ventilate? and, in the second place, How did houses ventilate themselves without any artificial arrangements? Ventilation was the renewal of air in a room or hall. It was necessary, if a room was close, that the air should be renewed a certain number of times an hour. The air was rendered "bad," in the first place, by the breath which human beings gave out; and, in the second place, by the gas, candles, or lamps which they burned. Breathing or respiration consisted in taking in air which was largely composed of oxygen gas, and the air breathed out contained carbonic acid gas. One hundred volumes of expired air contained about four volumes of carbonic acid gas, or about 1 grain in 55 cubic inches. If he were to breathe his own breath over and over again it would soon get very uncomfortable; he should feel oppressed and ultimately probably faint. It contained too little oxygen, too much carbonic acid gas and poisonous animal matters, breathed out from the lungs. Inspired air contained nearly 21 per cent. of oxygen gas, 79·02 per cent. of nitrogen gas, and a very small amount of carbonic acid gas—0·04 per cent. On the other hand, expired air contained 16·03 per cent. of oxygen, 79·59 per cent. of nitrogen, and 4·38 per cent. of carbonic acid gas. It contained besides some poisonous substance, but what that was they did not rightly know as yet. Expired air also contained water-gas, or steam, shown by breathing on a cold sheet of glass or metal, when it was bedewed with small drops. Water-gas was not poisonous directly. One could go into an atmosphere containing quantities of steam and feel no discomfort; but there was one effect of living in a damp atmosphere which made one very uncomfortable, and ultimately caused injury. Health and comfort depended on the free passage of moisture through the skin, and its removal by evaporation. Water would not evaporate into air already saturated with water-vapour, and the effect of that was to prevent perspiration, which, although one might not be conscious of it, went on every day. On some cold days, though it did not rain, the streets did not dry, because the air was already nearly saturated with moisture. There was also present in expired air a small quantity of ammonia gas, but that was really without influence on animal life one way or another. The amount of oxygen consumed by an ordinary man during a day was extremely great—26½ oz., occupying 19 cubic feet; and he evolved by breathing 32 oz. of carbonic acid gas, occupying 17 cubic feet. He also breathed out a quantity of water-gas varying from 23 to 12 oz. During sleep the amount of carbonic acid gas was very considerably diminished. Their temperature fell in sleep, and they breathed more quietly and slowly than during the day, hence the amount of carbonic acid gas diminished by about one quarter. From ¼ to ½ oz. was given off through the skin; and from 1½ to 2 lbs. of water evaporated from the skin in twenty-four hours. Combustion of gas, oil, and candles produced carbonic acid gas and moisture. A good candle formed $\frac{3}{10}$ths of a cubic foot of carbonic acid gas in an hour; a good oil-lamp half a cubic foot. A gas-burner burning 3 cubic feet of gas per hour gave rather more than 3 cubic feet. Hence two candles were nearly equal to one man. An oil-lamp gave two-thirds as much carbonic acid as a man, and a single gas-burner gave more than four men. Besides the fact of gas polluting the air with carbonic acid gas, it always contained traces of sulphur compounds, and these, on burning, yielded sulphurous acid gas,—unpleasant, but not injurious,—and sulphuric acid, the vapours of which were very irritating. It was advisable not to burn gas in libraries, because the sulphurous acid affected the leather bindings of the books. All lights charred small particles of dust present in the air of a room, and so caused "closeness." Those dust particles which got near enough the light to be singed but not to be burned up consisted very much, in carpeted rooms, of particles of wool. The Professor then quoted, from "Air and Rain," by the late Dr. Angus Smith, a table giving the composition of normal air in London and Manchester. The average amount of oxygen in the streets and parks of London was 20·885 per 100, while the carbonic acid was 0·0341. In Manchester,—a more smoky town than London,—the carbonic acid in the streets amounted to 0·0403 per 100, in the parks to 0·0369, and in the streets during fog to 0·067. The Underground Railway tunnel in London contained 20·6 per cent. of oxygen instead of 20·9. The London theatres at 10 p.m. contained 0·076 to 0·32 of carbonic acid. Then in Manchester ill-ventilated workshops contained as much as 0·30 of carbonic acid, and in close buildings 0·16. In the London hospitals, which were very carefully looked after in that respect, although perhaps not so much as they ought to be, allowing 500 cubic feet per inmate, during the day-time there was 0·044 to 0·075 of carbonic acid, at midnight 0·052 to 0·104, and at 5 a.m. 0·062 to 0·087. In hospitals, therefore, there was rather more than the normal amount. Candles went out when the oxygen was reduced to 18·5 parts per 100, and when the carbonic acid was increased to 2·1; and it was difficult for a man to breathe when the oxygen in the air was reduced to 17·2, and the carbonic acid increased to 3·5. If the carbonic acid was pure it was possible to breathe air containing as much as 20 per cent. without serious discomfort. Perfectly pure carbonic acid, therefore, did not appear to be so discomforting. Discomfort was produced chiefly by poisonous particles breathed out from the lungs. It was only quite recently that the number of dust particles in air had been counted, and this was due to Mr. John Aitken, of Falkirk, who had made a very remarkable discovery regarding the condensation of water on dust particles. The results were:—Outside (country), raining, 521,000 per cubic inch; outside (country), fair, 119,000; room, 4 ft. from floor, 30,318,000; room, near ceiling, 88,346,000; room, over gas burning, 489,000,000. Dr. Smith was able to find the nature of some of the particles, which consisted of burnt vegetable matter, probably wood used in lighting fires; hay, straw, and seeds; fibres, like flax, cotton, wool, starch granules; chiefly spores and sporidia, from $\frac{1}{10000}$th to $\frac{1}{1000}$th of an inch in diameter, developing rust and mildew, and also some almost certainly capable of developing various forms of disease, for example, fevers, measles, &c. Particles of coal or smoke did not appear to be dangerous, but particles of iron-filings, wool-dust, and flour produced bad effects. Thus, file-makers, grinders, weavers, and tobacco-workers suffered from lung disease. The object of ventilation was to dilute foul air with fresh, and to remove foul air, so that such matters might not affect health. The greatest source of danger appeared to be expired air, not so much because it contained carbonic acid as because it contained foul animal particles. It might be taken, however, that the number of particles in a room might be measured by the amount of carbonic acid, and though carbonic acid from candles or gas did not contain such animal particles, still they would err on the safe side if they regarded it along with expired carbonic acid. The carbonic acid should never exceed six parts in 10,000.

Dealing with the second heading of his lecture—the means of ventilation—he said that although air might appear to be still in a room, it was always in gentle motion. When it moved more than 19 in. a second, or about 100 ft. a minute, they would begin to feel a draught. In an ordinary room, which was well ventilated, it moved more slowly. Even though the air was perfectly still, its individual particles, which were excessively minute, were constantly moving about among each other. The warmer it was, the faster they moved. They could pass through any porous substance, such as plaster, dry stone, brick, &c., but not through water or thoroughly wet material; and, curiously, if the porous material was hot on one side and cold on the other, the air would pass from the cold side to the hot; that was to say, the air would enter a house provided it could get through the walls. This sort of motion was called diffusion. If it were possible to watch the motion of any single particle of air, its average rate of motion would be about one-third of a mile per second; but all the particles jostled each other, so that the actual progress made by any one particle averaged less than one two-millionth of an inch per second. The lighter a gas the more quickly its particles moved. Carbonic acid gas was nearly half as heavy again as air, and its particles moved more slowly. This continual motion caused gases to mix; even a heavy gas forming a layer below a light one mixed with the light one. Carbonic acid gas was heavy, yet it did not stay at the floor-level of a room; but mixed completely with the air of the room, which was much lighter. Hot air was lighter than cold air, and floated upwards at first; but ultimately mixed with the cold air, owing to diffusion. Although gases passed through porous substances, no solid particles like dust, however small, passed through; they were all deposited on the surface, or in the interior near the surface of the porous partition. A layer of cotton wool was a good filter for removing solid particles. Ventilation took place through chinks and cracks in windows and doors, through walls, floors, and ceilings, by special ventilators. The question came next, how much air did a man need? He breathed out between six and seven-tenths of a cubic foot of carbonic acid per hour, and

* For reports of the previous lectures, see *Builder*, pp. 109, 127, 142, 185, *ante*.

air containing more than six parts in 10,000 of carbonic acid from human breath was, as before stated, close and unwholesome. The natural amount of carbonic acid in air was 4 parts in 10,000. A man might, therefore, add from 2 to 3 parts of carbonic acid to 10,000, or six-tenths of a cubic foot to 3,000 cubic feet of air in an hour. If a room 10 ft. by 30 ft. by 10 ft. were perfectly air-tight, it would become stuffy if a man were to breathe in it for an hour. But air was renewed, the rate depending on the difference of temperature between it and the outside air. According to some experiments made by Professor Pettenkofer, with a difference of 7 deg. Fahr., the air passing into a room containing 2,650 cubic feet in an hour was, with fire on and doors and window shut, 3,320 cubic feet; and with no fire and all crevices stopped, 1,060 cubic feet. Hence, without fire, the room changed its air more than twice each hour, so that a room 10 ft. by 15 ft. by 10 ft. would be more than large enough for one man, even if doors and windows were tightly sealed. A much quicker circulation produced draughts. The air could not be comfortably changed more than three or four times an hour. In Paris experiments had been made to show what size of rooms could be comfortably occupied by hospital patients, and these gave almost identical results. They allowed 2,120 cubic feet per man in an hospital, 3,530 for wounded, 5,300 for epidemics, 2,120 for workshops, 1,060 for barracks, 2,120 for large rooms for long meetings, 1,060 for rooms for short meetings, and 464 to 530 for schools. These figures were got by practical experiment, not by theory. Air passed through stone and lime, a very large amount of these materials consisting of air-space. The space in Bath stone filled by air was one-sixth of its bulk; in Portland stone, one-seventh; in Caen stone, one-eighth; and in Ketton stone, one-sixth. One square yard of sandstone allowed 4·7 cubic feet of air to pass per hour; quarried limestone, 6·5; brick, 7·9; tufaceous limestone, 10·1; and mud, 15·4; with a difference of 4 deg. in temperature between the two sides. Although these various stones allowed very different quantities of air to pass, yet in practice it did not much matter which stones a wall was built of, because if a hard stone, such as a quarried limestone or granite, was used, the fragments were usually irregular, and more mortar was required; hence in practice an ordinary wall allowed the same amount of air through. About 7 cubic feet per hour per square yard was the average passage of air. Thus quarried limestone took about one-third of its weight of mortar; bricks, one-fifth to one-sixth; sandstone, one-sixth to one-eighth. As he had already stated, air was capable of passing through solid materials, but there was one essential proviso. The substance must be dry. If walls were damp no air passed. The spores in the dust settled and multiplied, instead of dying on the dry walls. The walls conducted away heat, and rendered the room cold. Ventilation, therefore, took place through the walls, or through the floor and ceiling, especially the latter. There was much more carbonic acid in the soil than in the air, hence air from the floor in a ground room was deleterious. Town refuse was a dangerous foundation for a house, for gases from decomposing matter entered through the floors. All rooms should be frequently aired. The organic matter productive of disease was oxidised in presence of air and moisture, and above all by sunlight. This was too often neglected. The walls of the wards of hospitals should be impermeable, so that germs could not lodge. It was essential that the walls should not be porous, and in order to avoid this, Portland cement, varnished on the surface, should be used as a coating. Ventilation should be artificially provided, and the walls, floor, and ceiling ought to be frequently disinfected and cleaned.

The lecture was copiously illustrated with experiments.

ART AND DESIGN.

The fifth lecture of the series was delivered on Wednesday evening, Feb. 6, by Mr. Banister Fletcher, F.R.I.B.A., who took for his subject "Art and Design, illustrated by diagrams and specimens in wood, iron, china, glass, &c., and by designs executed in wood as suggestions for the artisan." Sir John Lubbock, Bart., M.P., presided, and briefly introduced the lecturer.

Mr. Banister Fletcher said he had selected his subject because for a long time past English manufactures had ceased to hold undisputed sway in foreign markets, while now even our home markets were threatened. In answer to the question What was to be done to enable England to recover its commercial supremacy, it appeared to be admitted by all that the great want of the day was education in art and design, for it was said that the goods made by foreign manufacturers were more artistic in design than English-made goods. The great success of English goods in the markets of the world hitherto had been due to solidity, strength, honesty of construction, and endurance. But their supremacy, even in these respects, had of late been questioned, and much harm had been done to English commerce and manufactures by the fraudulent copying of English trade-marks by foreign manufacturers. So impressed with the necessity of studying ornament and design was a member of the Livery of the Carpenters' Company, that he had generously placed at the disposal of the Court of the Company the sum of £2,500, to be invested in the names of trustees, and the interest spent in giving prizes to, and assisting in other ways, those who, in competitions in that hall, produced the most artistic work in wood. The first of those competitions would take place this year. The liveryman in question was Mr. Henry Harben, a member of the County Council of London. Mr. Harben's own words in reference to the matter were as follow:—

"I am confident that in this country there is no fear as to solid work, but I am alarmed at the rapid strides that foreigners are making in competition with this country, and I am confident such competition will be successful unless more attention is paid to taste and design; and it is for this reason that I desire the prizes to be given for artistic work in wood, and also to further the education of workmen in art and design."

Having shown the intimate relationship of all the arts, the lecturer went on to say that the first and most essential element of beauty was proportion. He illustrated this by a doorway, which, if made twice as wide as it was high, offended all idea of proportion; if made as high as it was wide, it would be too squat; if added to by one-half in height, it at once became a well-proportioned opening. Its pleasing effect would be increased if made with an arched instead of a square top; the latter, in wide openings, had a heavy appearance, and nature curiously enough objected to it, for if the lintel were not cambered, it would present the appearance of being lower in the middle of the opening than at the sides,—a most unsatisfactory effect. Proportion, then, was the first thing to be thought of; no matter how plain the building or the design, if only well-proportioned it was almost certain to be a success. Proportion, however, would vary according to the work. For example, a drawing-room chair should not have the solidity of a dining-room or hall chair. If it had, it would offend the eye, conveying to it the idea of clumsiness, an impression which was accounted for by the absence of what was called "fitness." Stability also must be apparent in a design. A painful feeling was produced where that quality was absent, and therefore, in designing architectural work, it was important to keep void over void and solid over solid. But proportion alone would not ensure beauty, for, as Plotinus said, "unless individual parts have beauty, the beauty of a composition will be derived from the proportion established among ugly elements." It would be a failure of true art to make a design adapted for execution in one material and then to carry it out in an altogether different material. A design well adapted for execution in stone or marble would show false taste if executed in wood, and *vice versâ*.

The lecturer next proceeded to enforce these and other points by directing attention to a series of large drawings which he had had specially prepared by Mr. Raffles Davison for the lecture. These drawings showed specimens of good and bad work in juxtaposition. He then went on to say that at the recent Congress of "The National Association for the Advancement of Art, and its application to Industry," Sir Frederic Leighton, Mr. Alfred Gilbert, Mr. T. G. Jackson, Professor Aitchison, and other authorities, pointed out that the present low level of attainment in indusirial art was due to an uneducated public taste. Mr. Triggs (of the firm of Story Bros. & Triggs, cabinet-makers) had told him (the lecturer) that it was the love of cheapness,—the desire to have for 1*l.* what was really worth 1*l.* 10*s.*, that was at the root of the production of so much badly-designed and badly-made furniture; that the "great [*i.e.*, large] houses" only cared for large returns, no matter what the articles sold were like; to rapidly turn over a large capital at a profit of so much per cent.; that the old and good firms had been swept out of existence by the present conditions of trade; that the keenness of competition with the foreigner only left time for the production of showy and cheap goods; that it was useless to produce good articles, well made and in sound taste, because the masses wanted to have their drawing-rooms furnished like those of their betters, at any rate in *appearance*. The lecturer hoped that the country would speedily be aroused to a sense of the importance of the question at issue. He believed that if the English people could only know and realise the great deficiency in the artistic character of English goods, and that that deficiency was distinctly detrimental to English commerce, there would be a "new departure" which would astonish the world, although it would take some time to recover the lost "leeway." What was especially worth noting and emphasising was that well made and tastefully-designed articles of furniture could really be made to sell for less than the price asked for meretricious and ugly productions. Having shown how a skilled worker in wood, guided by good taste, could make many articles of domestic utility to adorn his own home, the lecturer concluded by saying that it was of no use for people in this country to try to find consolation by thinking that foreigners were doing no more than themselves. He read from a recent newspaper paragraph the following words:—"The love of art in France is illustrated in a suggestive way by the number of students who enter the School of Fine Arts in Paris. Twelve hundred students were on the roll last month. This is independent of the thousands who study in the studios of men of capacity. In our own Royal Academy classes there are never more than 200 or 300 students; and few of the leading artists admit students to their studios." Those who followed Art had the satisfaction to be derived from the fact that the principles of art, when found, never changed; therefore art-workers had an advantage over those who followed Science. As to the latter, it had been well said that "the continued additions made to the common stock of knowledge frequently effect a complete revolution in their basis and superstructure: that the established doctrines of centuries may be swept away by the discoveries of a single day." He wanted young art-workmen to remember that success was only to be achieved by those who took a genuine interest and pleasure in their work, without thinking primarily of the mere money they would earn. He believed with Bacon that it was the duty of every man to try to elevate his trade or profession. If every man became an earnest worker to that end,—and each one present could do something to advance the cause of art-education and technical proficiency,—he would be helping to regain commercial *prestige* and prosperity for his country, and, what was higher and more to be desired, to make the nation stand in the forefront of art-producing and art-admiring nations. (Applause.)

The last lecture of the present course was delivered by Mr. Thomas Blashill, F.R.I.B.A., Superintending Architect of Metropolitan Buildings, on Wednesday evening last, the subject being "English and Continental Doors." There was a good attendance. Mr. Alfred Rosher, Master of the Company, presided. A report of this lecture will appear in our next.

Surveyorship, East Barnet.—The East Barnet Valley Local Board, at a meeting on Tuesday evening, elected Mr. George W. Brumell as surveyor and sanitary inspector, in the room of Mr. Ireland F. Rumble, who died suddenly a few weeks since. There were 179 applicants for the appointment, which number was reduced to nine, who were required to attend before the Board. The number was then reduced to three, and Mr. Brumell was ultimately selected by a practically unanimous vote.

The Royal Hotel, Weymouth.—The lease of the Royal Hotel, Weymouth, with its extensive premises, situate on one of the best sites of the town, facing the centre of the Esplanade, will expire in October of this year. King George III. used to hold his Courts there whilst residing in the town. It is proposed that the premises should be demolished and the site offered for sale.

THE ARCHITECTS' BENEVOLENT SOCIETY.

THE annual general meeting of the subscribers and donors to this Society was held on Wednesday afternoon last in the Arbitration Room at No. 9, Conduit-street, Professor T. Hayter Lewis in the chair, in the absence of the President, Mr. Alfred Waterhouse, R.A. The Hon. Sec., Mr. William H. White, read the annual report, which was prefaced by a *résumé* of the reports for the years 1885-87, made for the purpose of insertion in the forthcoming "Red Book" of the Society, no "Red Book" having been issued for the last three years, though the reports have been published in the "Journal of Proceedings" of the Royal Institute of British Architects. The following is the report for the year 1888:—

"During the past twelve months, six meetings have been held by your Council; 445*l.* have been distributed among thirty-four applicants, and three pensions of 20*l.* each have been paid. The amount received by subscriptions has not decreased, being 341*l.* 3s., as against 340*l.* 18s. received in 1887. The Architectural Association and the Royal Institute of British Architects continue their subscriptions, and nine new subscribers have been added, but your Council regret that the arrears for 1888 amount to almost twenty-one guineas, and express the hope that these may be paid during the present year. The Capital Account receipts amount to 181*l.* 15s., including 100*l.*, a bequest free of duty, by the late Mr. George Godwin, a bequest of 50*l.*, free of duty, by the late Mr. J. R. Botham, and a donation of 15*l.* from Mr. William Emerson. Donations were also received from the Nottingham Architectural Association; the Royal Institute of Architects of Ireland; the British Architectural Book Society, per Mr. Cole A. Adams; Mr. R. St. A. Roumieu; Mr. Harold Rathbone; and the late Mr. Charles Richard Pink, whose recent early death your Council and the Society have to deplore. Mr. Pink had been a contributor to the Society since 1881, and a Member of the Council since 1886. Your Council have also to record with regret the decease of Mr. E. N. Clifton, who was for more than thirty years a contributor, and was several times elected a Member of Council; of Mr. R. P. Pullan, a frequent donor to the funds; and of Mr. C. N. Ware, a subscriber since 1864. Your Council having lately purchased £300 London and North-Western Railway 4 per cent. Debentures for 399*l.* 7s. 6d., the invested capital now reaches the sum of 7,426*l.* 2s. 4d. This purchase has been made out of the capital account, to which all legacies and donations are placed for investment only, in accordance with By-law 55.

The income account and balance-sheet for the year ended December 31, 1888, are herewith submitted. The decrease in the total income receipts, which in 1887 were 601*l.* 9s. 8d., and this year are only 579*l.* 16s. 3d., is due to the fact that in 1887 a larger balance was brought forward, and also three years' income-tax was remitted.

The 'Red Book' will be sent to every contributor as soon as published, and your Council trust each will use it as a means to procure new subscribers and renewed donations. Your Council are of opinion that the regular annual issue of this book would tend to make the Society more known, and therefore better supported. A suggestion was made that the cover should be altered, and the size of the book enlarged, Mr. W. Hilton Nash, Member of Council, kindly offering to design a new cover; but, while your Council approve of the suggestion, they are of opinion that the change should not be effected until March next, when the Society will have completed the fortieth year of its foundation; the new series by this means will commence in 1890."

The Chairman, in moving the adoption of the report, said he thought they might congratulate themselves to some extent on the progress of the Society, slow and small as that progress had been. He found from the *résumé* of the reports of the last few years that whereas in 1880 the subscriptions amounted to 315*l.*, in 1888 they amounted to 341*l.* In the same period the dividends on invested funds had increased from 155*l.* to 224*l.* The grants made in 1880 amounted to 345*l.*; in 1888 they were 455*l.* The pensions granted in the last year amounted to 60*l.*, instead of 40*l.* in 1880. But, notwithstanding this, the Council often felt it to be quite impossible to deal adequately with claims which were made upon the Society by most deserving applicants. The Council had need for double the amount of money now entrusted to them. He could not help saying that, looking at the large number of men in the profession, the total amount of subscriptions last year,—341*l.*,—was a very meagre contribution from the architects of England, Scotland, and Ireland towards the relief of their brethren in distress (hear, hear). They certainly ought to be able to do better than that (hear, hear).

Mr. Charles Fowler, in seconding the adoption of the report, said he quite agreed that the inadequate support given to the Society by the members of the profession crippled the hands of the Council; but he thought it should be remembered that the Artists' General Benevolent Institution, which was established prior to the Architects' Benevolent Society, and was largely supported by architects, gave a great deal of help to architects and their families in distress, so that what was done by the Society did not by any means represent all that was done for the relief of distress in the profession.

Mr. J. Macvicar Anderson, in supporting the motion for the adoption of the report, said that while Mr. Fowler's statement was quite correct, he did think that architects ought to regard the Architects' Benevolent Society as having a primary claim upon their support, seeing that it was a society specifically identified with the profession. Indeed, he could not help feeling that the meagre income of the Society was a discredit, not to say a disgrace, to the profession (hear, hear). The funded property of the Society at present amounted to a little over 7,000*l.*, but it ought to be raised to at least 10,000*l.* (hear, hear). If any movement could be set on foot to attain that object, he should be glad to assist.

The motion was unanimously agreed to, and after the election of new members of Council to take the place of those retiring by rotation, and the transaction of other formal business, the meeting terminated.

ARCHITECTURAL SOCIETIES.

Leeds and Yorkshire Architectural Society.—A lecture on "Colour in Architecture and Interior Decoration" was given before the members of the Leeds and Yorkshire Architectural Society by Mr. William Scott Morton, of Edinburgh, on the 4th inst. The President of the Society (Mr. H. Perkin) was in the chair. Mr. Morton, whose lecture was illustrated by a collection of diagrams, observed that among the great architects of recent times colour had not been a strong point. Speaking generally, there did not seem to be much scope for colour display in their external work, but this might be owing to the limitations as to the materials that were suitable for their buildings. Artistically, it would perhaps be admitted that pictorial effects in large cities, and in general landscapes as far as buildings were concerned, depended more on mass and grouping than on colour, provided the prevailing tone were not objectionable. In America there seemed a much better field for architects in external work than in this country; the atmosphere was more pure, even in large American cities, and the material was very fine. He remarked generally that our northern regions were not favourable for the development of a strong colour treatment, the pitch of prevailing colour in sky, sea, and landscape being for the most part low in tone. In a reference to the Pompeian colours, he said all good reds were based on a yellow ground. With our prevailing greyish low tone we ought to use as a basis for all our colouring the complementary of grey, which would be a yellowish tint. The aim of the colourist should be to give to each apartment be treated a colour of pitch which would give some pleasurable excitement. It was evident that public places and apartments which were only used for a few hours at a time might well be decorated in a strong manner, whilst rooms for more homely and restful purposes required a more restful treatment. And in the tinting of all interiors it was of the first importance that flesh-colour should be borne in mind. One often saw wall-colours and masses of curtain and wall coverings selected which disagreed with the general tint of the face. This was utterly wrong, and so was the choosing of wall-coverings, where paintings were to be hung, which were not subordinate and accessory to the pictures. In considering the ceiling and mural decorations, the value of flesh colour struck one very powerfully, and it seemed as if its treatment enabled them to determine the merit of the artist as a colourist. At the present time there was a great desire to revive a good style of pictorial decoration. It was somewhat unfortunate that art of this class had been looked upon as not on such a high level as ordinary figure and landscape painting, but it required a very exceptional mind and knowledge to conceive and execute such work as should be done in this connexion with architecture. One other unfortunate circumstance also lay in the increasingly migratory tendency of the times, and the shortness of ground leases, especially in London. On these grounds there was a natural disinclination to spend much money on what could not be easily removed, but it was to be hoped they should have earnest workers in this direction, who would be able to design and execute expressive and broad figure and landscape decorations at such cost as would allow of their becoming more general. In concluding, he said there still remained great difficulties in the study of colour, because there was so much that was undefinable. A discussion followed, the President, and Mr. W. H. Thorp, Mr. J. B. Fraser, Mr. J. P. Pollard, and Mr. Marshall taking part therein.——In the Library of the Philosophical Hall, on Monday evening last, Miss Garrett, of London, delivered an address before the members of the Leeds and Yorkshire Architectural Society on the subject of "Interior House Decoration." The President of the Society, Mr. H. Perkin, occupied the chair.

Liverpool Architectural Society.—Mr. Edmund Kirby, President, in compliance with a requisition, has convened a special meeting of the Liverpool Architectural Society, to be held on Wednesday evening next, March 20, to consider and pass the revised rules of the Society, on its alliance with the Royal Institute of British Architects.

Edinburgh Architectural Association.—At the usual meeting of this Association, held on the 7th inst., Professor Baldwin Brown presiding, Mr. James Clark read a second paper on "Ornament." The lecturer considered the various styles of ornament, comprising the ancient, mediæval, and modern periods, each of which had, he said, three important sub-divisions: in the ancient—the Egyptians, the Greek, and the Roman; in the mediæval—the Byzantine, the Saracenic, and the Gothic; and in the modern—the Renaissance, the Cinquecento, and the Louis Quatorze. The lecturer next took up in detail the peculiarities of Indian, Chinese, and Japanese ornament. In referring to the importance of Japanese art, its leading characteristics were delineated in detail, and the study of these urged upon the members. No decorative art, he said, had exercised such an influence within the last twenty years as that of Japan, and every year great quantities of porcelain, enamels, carved ivories, bronzes, textiles, and leather papers were imported into this country. It was to be regretted, however, that many of these were not in a sense purely Japanese art, but were manufactured to meet the demand created by the English and American markets. Symbolical ornament was next gone into, and its importance and widespread influence noted. It was pointed out that symbolism formed the key to many kinds of ornament, adopted more particularly in architecture, but also in sculpture, heraldry, &c. Reference was made to the symbolical character of Egyptian, Jewish, Byzantine, Gothic, Indian, and Japanese ornament, and to the fact of its prevalent use in our cathedrals and churches. Mr. Clark pointed out, in regard to the application and misapplication of ornament, that, while deprecating a slavish copying of past styles, the designer of the present day should adopt and combine all that was best in the different periods of the past. The object of all ornament should ever be to decorate construction, and not to overload or overlay it. The decorator must aim at simplicity, repose, expression, fitness, and proportion, as opposed to excess of gaudiness and extravagance, uselessness, falsehood, lifelessness, clumsiness, want of balance, and the indiscriminate mixing of styles. The importance of colour in ornament was urged, and special reference was made to its charm and beauty as exemplified in past ages. In conclusion, the lecturer called attention to the present art revival, and such adjuncts to decoration as mosaics, tiles, pottery, stained glass, wood carving, and wrought iron.

Royal Institute of the Architects of Ireland.—A special general meeting of this Institute was held on the 11th inst. at 37, Dawson-street, Mr. Thos. Drew, R.H.A., in the chair; present also Messrs. Sandham, Symes, J. R. Carroll, R. Cochrane, W. S. Symes, F. Franklin, J. L. Robinson, W. M. Mitchell, R. C. Millar, G. C. Ashlin, and Albert E. Murray, hon. sec. The meeting was convened to consider the advisability of affiliation with the Royal Institute of British Architects, as provided in their new

Charter. The hon. secretary read the notice of meeting; also read letters of apology from Messrs. Wm. Carroll, jun., of Ennis; W. J. Watson, of Warrenpoint; and Wm. Watt, of Belfast, &c. After considerable discussion on the subject, it was proposed by Mr. J. R. Carroll, and seconded by Mr. Albert E. Murray, and passed unanimously:—"That the Royal Institute of the Architects of Ireland desire to be one of the societies allied with the Royal Institute of British Architects, and that the hon. sec. be requested to take the necessary steps to have the alliance effected."

GREEK MOULDINGS ILLUSTRATION FUND.

SIR,—It has come to my knowledge that the object of this fund is not fully understood, although the origin and purpose were explained by you,—namely, that the British School of Archæology at Athens, acting upon a suggestion made by you to the Hellenic Society, and referred to the School Committee, voted a certain sum from their funds to enable one of their students, Mr. R. W. Schultz, architect, to go out to Athens to make full-sized drawings of the finest and most interesting examples of the mouldings used by the Greek architects.

From drawings of certain mouldings which he had shown to the School Committee,—as well as other drawings of high excellence,—they were perfectly satisfied that he could execute the proposed work in the best possible manner, and would carry out such a mission, if he undertook it, most conscientiously. Unfortunately, the funds in their hands would not admit of his being able to cover the whole ground,—especially as an attempt to induce the Council of the R.I.B.A to assist in the undertaking met with no response. Under these circumstances you made the appeal in your journal which has produced a portion of the result aimed at; but there is room for at least twice the amount that has been already subscribed to enable Mr. Schultz, who has now been at Athens for more than a month, to make the full use of the season and the opportunity.

F. C. PENROSE.

The Chapter House,
St. Paul's Church-yard.
March 13, 1889.

P.S.—Perhaps I ought to mention that an independent request had been made in 1887 to the School Committee from Mr. H. Stannus to embark in this investigation.—F. C. P.

THE EGYPTIAN HALL AT THE MANSION HOUSE.

SIR,—I see that Mr. Brydon, in his paper on the "English Renaissance,"—for which, let me say, all who appreciate as it deserves that native adaptation of the Classical styles, which, too long pushed on one side by the Gothic revival, is now happily re-vindicating its place in popular estimation, owe him hearty thanks,—has brought up again the oft-told tale of Palladio's design for the Mansion House offered by Lord Burlington, being rejected, on the score of its author being neither a freeman of the City nor a Protestant, in favour of that of Dance, who united both those qualifications for City favour. Probably there may be some groundwork of truth in the story. We can readily understand, and to a certain extent justify, the preference exhibited by the Committee of the Corporation for the design of an Englishman over that of a foreigner. But the details of the story may safely be rejected. The whole rests on the sole authority of the editor of Ralph's "Critical Review of the Public Buildings of London," writing nearly half a century after the erection of the Mansion House, and the way in which the "humorous story," as it is termed, is introduced leads to the idea that the writer did not intend it to be believed, and only aimed at raising a laugh at the expense of the Aldermen and Common Councillors of the City, always safe objects of cheap ridicule. Whether they were wise or unwise in preferring the English to the Italian design cannot be determined without seeing the rejected plan, and what that was we know not.

But the Mansion House is happily still standing, though sadly mutilated, to speak for itself, and to bear visible witness to the architectural powers of the designer. I am well aware that it has long been the fashion to decry this building as a heavy and tasteless pile, "equally discreditable," is the verdict in Britton's "Public Buildings of London," "to the taste of the architect and his employers." Ralph's editor asserts (whether truly or not I cannot say) that Dance,—"the man pitched upon," he contemptuously styles him, on the rejection of Palladio's design,—had been originally a shipbuilder, and that he carried the ideas of his former trade into his new profession. The façade of the Mansion House, he says, "bears all the resemblance possible to a deeply-laden Indiaman"; "the stairs and passages are all ladders and gangways"; while "the superstructures" (now removed) "answer accurately to the popular idea of Noah's Ark." In spite of all this vituperation,—criticism it cannot be called,—I am not alone in regarding the Mansion House as a building stately in itself, rich in well-conceived ornamentation, and most suitable for its purpose. It looks what it is, a civic palace. No one could mistake it for anything else. This, indeed, is the great merit of all Dance's buildings,—they express their purpose. Who could mistake Newgate for anything but what it is,—a prison? St. Luke's, with its long rows of windows high up on the walls of the cells, bespeaks its object as a lunatic asylum. In Guildhall he was not so happy. He knew as little of Gothic as the men of his day generally, and he worked in fetters. But if not correct in style, there is a bold originality in the design which goes far to atone for its errors, and stamps a distinctive character on it. It, too, looks what it is,—or rather did so before its partial demolition left the front in its present deplorable lop-sided condition. Newgate, however, is certainly Dance's crowning effort, and, to quote the late Mr. Fergusson's appreciative words, "though only a prison, and pretending to be nothing else, is still one of the best public buildings in the Metropolis," and, I may add, one which our sadly characterless City can least afford to lose. But we are told it has outlived the purpose for which it was built, and occupies ground which might be better employed. So I suppose, the popular will being once declared, the fate of this striking building is sealed, and that, like Wren's churches, and Northumberland House, and the colonnade at Burlington House, and too many other fine and interesting buildings,—are we to include Gibbs's exquisite Church of St. Mary, which gives such dignity and beauty to the Strand?—it may ere long exist only on paper, to make future generations wonder at the reckless blindness of a so-called age of culture which could wilfully destroy so many of its most precious architectural inheritances.

But if Newgate is Dance's *chef d'œuvre*, the Mansion House is not far behind it. I cannot always agree with Mr. Fergusson's verdicts, but he has my thorough agreement when he describes it as "a building not certainly in the purest taste, but an effective and gorgeous design." Nay, I can go along with him when he deplores the uncalled-for removal of the upper stories of the Egyptian Hall and of the Ball-room,—the latter of which many of your readers will remember,—before the loss of which "two crowning masses," as he says, the building "really stood proudly and well above the surrounding houses." I confess to some little surprise that Mr. Brydon should have treated the architectural merits of this truly characteristic specimen of the English Renaissance with a silence that almost looks like contempt. I cannot believe that one who shows so great an appreciation for the English Classical architecture of the two last centuries really entertains such a feeling towards Dance's noble building. Few buildings of the day, especially in its interior fittings, its doorcases and mantelpieces and panelling, and its minor details, all carefully thought out, more fully illustrate "the great mine of artistic wealth," "the embodiment of the civilisation and life of the people," as he justly terms it, which lies so close to us, but of which the modern designer too often takes so little heed. May we hope that one so well qualified for the task will furnish us, through your pages, with a careful survey of this admirable example of the style of his affections?

The more closely the Mansion House is examined the more evident will it be that it was not, as Ralph's, or his editor's, "humorous story" suggests, the work of a novice turning his attention for the first time to a new art, but that its designer was one who thoroughly understood his business, and who spared neither study nor pains to make the building worthy of its object. It is certain that Dance was a careful student of Vitruvius, of whose rules his well-known "Egyptian Hall" is an accurate reproduction. The name "Egyptian Hall" has, indeed, proved not a little perplexing to many, and various absurd theories, which it is needless here to particularise, have been invented to account for it. Mr. Moffat in Britton's "Public Buildings," already referred to, confesses himself "unable to account for the appellation, as it displays no vestige of Egyptian architecture or decoration." Another writer shows some inkling of the truth when he states that the "architectural ornaments which gave it the name have been removed." But he evidently supposes that the hall once showed decorations of the style of Edfou or Karnak; or that it distantly resembled the "Egyptian Hall" in Piccadilly. Had these gentlemen known their Vitruvius better, they would have been saved all this puzzledom. They have only to refer to his treatise "De Architectura," (lib. vi., c. 5, § 31) to find a description of what he designates an "Egyptian Hall," from which that in the Mansion House takes its name. Not that its architecture is in any true sense Egyptian, but simply that, as in the great hypostyle halls that commonly form part of the complex plan of the earlier and larger Egyptian temples, the chief range of columns, or "ground story," is surmounted by an upper range of columns of smaller size, the intervals between which being open, as in a mediæval "clearstory," light is admitted to the central portion of the hall. The Egyptian Hall at the Mansion House, as Dance built it, exactly answered to Vitruvius' description. What it was may be seen in Campbell's "Vitruvius Britannicus," (ed. 1767). Above the existing row of Corinthian columns, eight on each side, was a second row of three-quarter composite columns, about two diameters less than the chief order from the entablature of which they rose. Between these latter was a series of windows, forming a clearstory, affording the light in which the hall is now so lamentably deficient, especially since the two end windows, the only windows left, have been filled with stained glass. The ceiling of the hall was flat. This upper order and its windows were contained in one of Mr. Fergusson's "crowning masses," popularly known as "Mayor's nests," as may be seen in plates in Strype's "Stow" (ed. 1754), in Maitland's "London," and other old prints. Why this characteristic feature of Dance's design was taken down, or when the building thus received its first mutilation, I cannot say. The date is easily recoverable from the civic archives. I remember to have seen a printed return of the expenses of the alteration, but it was many years back, and I neglected to take a note of it. Names survive the things that gave them. The demolition of the upper storey has deprived the room of all right to the title, but the "Egyptian Hall" it is, and will, doubtless, ever remain so, until again

> "Some demon whispers 'Visto have a taste,'"

and the whole fabric,—I have heard it threatened,—is demolished in obedience to some ruling whims of the day, or the whole civic municipality is swallowed up in the new County Council, and Lord Mayors cease to exist save in history. A reference to Vitruvius will show that in its present form, with a single row of columns supporting an arched ceiling, lighted only at the ends, the hall corresponds to his description of a "Corinthian Hall." But the name was not changed at the time of the alteration, and it is too late to do so now.

The corresponding superstructure, over the Ball-room, was removed only a few years since. It had a double row of windows similar to those of the Egyptian Hall, the loss of which renders this once fine room somewhat gloomy, while the proportions are much injured by the lowering of the ceiling.

Ralph's complaint that "the staircases are ladders" is not now without some justification. The two existing staircases are at the same time too narrow and too steep for a mansion of such pretensions. But for this Dance is not responsible, but the mutilators of his work. In the plan given in the "Vitruvius Britannica," it will be seen that originally a broad and stately staircase, opening from the east side of the present Saloon, connected the first and second stories, filling the space now occupied by the inner drawing-room and the bedroom above, formerly the State bed-chamber. When the alteration was made I do not know. Why it was made is clear enough. The Mansion House is still somewhat deficient in sleeping accommodation, and originally must have been still more so. So the State staircase was sacrificed to make a State bedroom. It is doubtless due to this room not having been one of the original apartments of the house that it is deficient in the stately decorations, such as doorcases, mantelpiece panelling, &c., which are so conspicuous in the other bedrooms. Another alteration on Dance's original plan has certainly produced nothing but advantage. The present Saloon, occupying the central area of the house, was at first an open courtyard, surrounded with an unprotected colonnade, which afforded the only passage from the "Long Parlour" or dining-room to the "Drawing-room" on the other side. On snowy nights, I have been told, the flakes would blow in on the ladies' dresses. The covering in this area with a glazed roof has added greatly both to the comfort and the usefulness of the Mansion House, and has supplied a really beautiful feature to the design.

Those who desire to know what the appearance of the interior of the Egyptian Hall was before it lost its upper story, will find what they want in the too-little-known Assembly Rooms at York. These were built, at his own expense, by the same noble amateur architect, "that truly English Vitruvius" (Drake), Richard Boyle, third Earl of Burlington, who figures in Ralph's apocryphal story. The first stone was laid March, 1730, and the whole was finished before Drake published his "Eboracum" in 1736. On its first erection it was described as "an antique Egyptian Hall," taken by Lord Burlington "from Palladio, who," it is said, "gives the plan, but tells you it was never executed out of Egypt"! This really beautiful room is of smaller dimensions (112 ft. long by 40 ft. wide and 40 ft. high), but of more graceful proportions than the original Mansion House Egyptian Hall. On each side of its length is a range of eighteen unfluted Corinthian columns, returned at either end, where there are four more, making forty-four on the whole. The colonnade is doubled in the centre of the length, where there are convenient lobbies and retiring-rooms. The upper story, or attic, is lighted by seventeen windows on each side, divided by composite pilasters, with wreaths dependent from their capitals. The ceiling

is flat and panelled. Every detail of this beautiful design is most carefully studied; indeed, there are few works of the English Renaissance which, for sense of proportion and harmoniousness of effect, deserve more attention, or which more clearly display the genius of its designer, immortalised by Pope,—

"Who plants like Bathurst or who builds like Boyle?"

Though less mutilated than the London hall, this fine design has not altogether escaped the hand of the despoiler. As Lord Burlington designed it, the entrance was by a graceful semi-circular portico, which, in the earlier part of this century, was removed for the widening of the street, and replaced by a correct but frigid composition in Grecian Ionic, entirely out of keeping with the interior of the building.

EDMUND VENABLES.

Precentory, Lincoln.

THE PROPOSED ADDITION TO WESTMINSTER ABBEY.

SIR,—What we want to see in the Abbey is the old arcading back again beneath the aisle-windows, and a riddance of the tons of core encased in marble or surmounted by effigies which go to make up the memorials that encumber the room and obstruct sight and sound, and are a blot on the interior of the ancient church, when looked upon as a house of prayer and devotion, as apart from its extra function as a national burial-place.

The Lady-chapel at St. Saviour's, Southwark, is a fair model, to my mind, of what is required, as being somewhat low, inexpensive, and at the same time of extensive area. The disposition of the monuments, after all wall-spaces are occupied, might be from pillar to pillar, filling alternate bays, and in set instances jutting out at right angles, like great library book-cases, back to back against screens.

There are no Gothic-looking things at St. Paul's, and why should the poor Abbey be loaded with the other sort, to its lasting disfigurement?

Those whom the memorials commemorate have no more responsibility in the matter than probably we shall have, and if they could be canvassed those who put up the monuments even would probably scout the idea of entailing on posterity anything cumbrous or out of keeping,—Society for Ancient "Stick-in-the-mud" notwithstanding.

Living worshippers learn that the church is something to them, and that it might be more to thousands than it possibly can be so long as it is afflicted with the incumbrances imposed upon it during a period of death and degradation, save the actual dying; and it is nothing short of Church revival, which clamours for the area which is the people's, and which is now monopolised and misappropriated by effigies which stereotype a state of matters which happily proved only transient. If the Abbey is a church first, and then a burial-place, then off to Campo Santo with Newton and those like interferences with Church usage; if it is first a burial-place, then a church, I have done.

H. WEBBER.

THE "CATES" PARIS STUDENTSHIP.

SIR,—The conditions of the above state that unless four candidates present themselves, the Studentship will not be awarded.

I think this condition is likely to prevent many going in for the competition, since, if a student work hard to prepare himself for the examination, and become ever so proficient, he will stand no chance of winning the studentship unless three other men, no matter how ignorant of the French language, present themselves.

Would it not be wiser,—if it is not too late to make the revision,—for the judges to reserve the right of withholding the studentship *if there is not sufficient merit shown*?

It would indeed be a pity if a slip of this sort prevented Mr. Cates's generous offer attracting four competitors.

PRUDENTIA.

March 12, 1889.

*** We think our correspondent is in the right.

"RESTORATION."

SIR,—According to your last week's paper, Mr. Micklethwaite objects to an old font being "thoroughly restored."

What would he think of the chancel of St. Pancras, Exeter, which has been pulled down to the foundations and "restored" so cleverly that even an expert may be excused if he think the building is of original Early English work with Decorated additions?

G.

CARTMEL CHURCH.

SIR,—I shall be obliged if you will allow me a short space in your columns in order to submit the following query, which, no doubt, some of your archæological correspondents will be able to answer, or at least throw some light upon:—

"Of what stone was Cartmel Church, Lancashire, built, and from what place was the stone procured?"

I refer to the original building, which was founded about 1190 as a monastery, and restored in the middle of the seventeenth century.

A. R.

The Student's Column.

TOWN DRAINAGE.

XI.—POSITION OF A HOUSE-DRAIN.

THE manner in which the offices of houses are arranged, either from necessity or choice, makes a considerable difference in the ease with which they may be drained, and makes a study of their position necessary before proper lines of drainage can be laid down. Large houses, if detached, are easier to drain than small ones which are not so, when, in the case of detached houses, the premises can be approached on either side. The choice of side depends upon the relative situations of the water-closets and the bath-room, and upon that of the scullery sink. If the water-closets are on the left-hand side, as in fig. 1, that is the side on which the drain

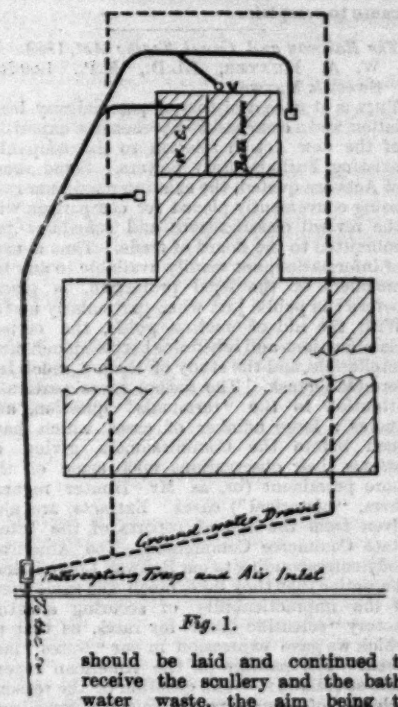


Fig. 1.

should be laid and continued to receive the scullery and the bath-water waste, the aim being to receive this at the head of the drain, and the water-closet branch should be received as far down the drain as possible, whether there be one branch or more, but always below the bath-water waste, and below the scullery outlet, where it is possible. In laying drains we have to do with houses already built, as well as with new ones, and must then take things as they are; but in the case of new houses, the drainage of the water-closets may be much facilitated by having regard to the principle just stated, viz.: that the drains should be laid on that side of the house on which the water-closets are arranged; that they should be situated so that their branches may be joined with the main drain as low down in its course as possible, and that the bath-room be so situated that the waste-water may be discharged into or near the head of the drain.

In the case of semi-detached houses, there is but one way of approach, but even in these it should be an object to receive first the water-closet branch; next, the scullery branch, and the bath waste at the extremity of the drain. In town houses, with close frontage, there is hardly any choice of position for the drain, and in small houses none. Some of these are much more difficult to drain than large houses. We cannot define the smallest house, but may regard the indications of the Model By-laws as sufficient in this respect. Their adoption by the sanitary authorities of towns is not compulsory, but they emanate from a fountain of wisdom in town drainage and kindred subjects, and their inculcations should be favourably regarded, as being the embodiment of the best judgment extant upon the subject. They go no farther than to lay down general directions, and they may be safely followed. The 54th section directs that "every person who shall erect a new domestic building shall provide in the rear of such building an open space exclusively belonging to such building, and of an aggregate extent of not less than 150 square feet, and free from any erection thereon above the level of the ground, except a water-closet, earth-closet, or privy, and an ash-pit. He shall cause such space to extend laterally throughout the entire width of such building, and he shall cause the distance across such open space from every part of such building to the boundary of any lands or premises immediately opposite or adjoining the site of such building to be not less than 10 ft. The width is here taken at 15 ft., and the same width for each of the following classes of houses, viz., the 2nd, 3rd, and 4th in the following description. The sketch-plan, fig. 2, repre-

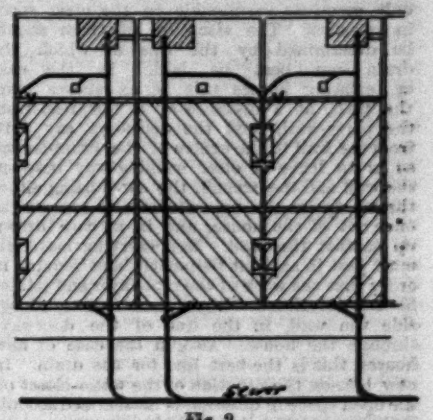


Fig. 2.

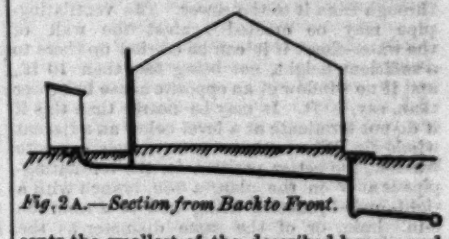


Fig. 2A.—*Section from Back to Front.*

sents the smallest of the described houses, and fig. 3 represents either of the other classes described, viz., 2, 3, or 4, if allowance be made

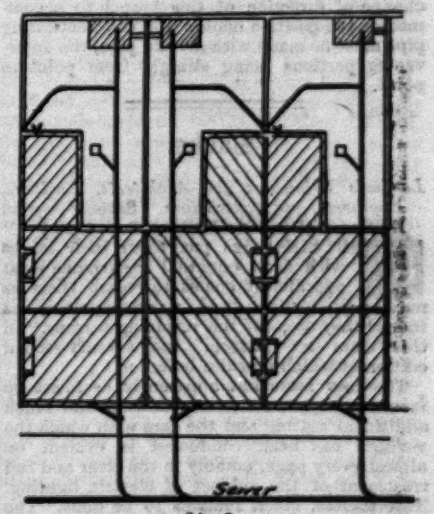


Fig. 3.

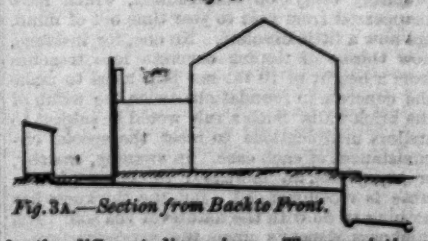


Fig. 3A.—*Section from Back to Front.*

for the different dimensions. These variations in the distance across the open space have relation to the height of houses, taking the height to be that from the surface of the ground to the level of half the height of the roof, or to the top of the parapet, whichever may be the higher. If the height be 15 ft.,—the second-class,—the distance across the open space from the house to the boundary is to be 15 ft. at the least. If (3) the height be 25 ft., the distance is to be 20 ft. at the least; and if (4) the height be 35 ft., the distance is to be 25 ft. at the least.

In many cases it is impracticable to lay a drain from the back premises of a house to the sewer by any other way than under the house-floor, such as in those represented in the accompanying sketch plans 2 and 3, if there be no sewer at the back of the houses. There is sometimes a back road to such houses, in which there may be a sewer. Clearly, in that case, the proper way is to drain the premises into it. But if, as is more often the case, there is no such sewer, there is then no other way than under the house-floor, if the houses belong to different owners, which is also a frequent case. The water-closet and ashpit are the only erections permissible on the open space in question. The situation of these should be determined by the line in which the drain can best be laid. In the case of existing houses this is, as shown upon the plan, at a distance of a few feet from the party-wall, next the doorways, say 4 ft. from the wall to the centre of the drain-trench so as to leave a clear walking-way between the wall and the trench, the earth being either thrown up on the opposite side or removed at once out of the house, and in no case thrown up against the wall. Men carrying materials must pass in and out frequently, and require, in order that the work of the pipe-layer and jointer be not interfered with, a clear footway alongside the wall, in the line of the doorways through the house. Also, in the case of new houses, this is the best line for the drain. In new houses, the situation of the water-closet on the open space in question is determined accordingly, so that the line of drain may be straight through from it to the sewer. The ventilating-pipe may be erected against the wall of the water-closet if it can be carried up there to a sufficient height, not being less than 10 ft., and if no window of an opposite house be nearer than, say, 10 ft. It may be nearer than this if it do not terminate at a level below an adjacent window. Where there is any such opposite window, the better position for the ventilating-pipe is at V on the plan, a 6-in. branch with a right-angled junction being laid to it from the 6-in. drain, or of the same diameter as the drain, whatever that be. This is the only situation in house drainage in which a right-angled junction is proper: all others are oblique. The change of direction of this branch to accommodate the position chosen for the ventilating pipe must be made with a bend pipe, the intervening portions being straight from point to point.

Books.

Laxton's Price-book for Architects, Builders, Engineers, and Contractors. Seventy-second Edition. (London: Kelly & Co. 1889)

CERTAIN books put forth their leaves with such punctual recurrence that one almost comes to regard them as natural productions, and a consequence,—as indeed they are,—of the revolving seasons. In this class is "Laxton," the seventy-second edition of which now lies before us.

The new issue has apparently been set up from fresh type, with some omitted and much additional matter, and the care with which the revision has been conducted is evident on almost every page, notably in the clear and full treatment of the subject of electric lighting. Nevertheless, much remains to be done. The prefatory essays on construction, which have reappeared from year to year time out of mind, are now a little obsolete. No one, for instance, now thinks of tipping concrete into trenches from a height of 10 ft., nor is it usual to make the concrete in foundations twice the width of the brick walls. Such a rule would be subject to endless modifications to meet the special circumstances of each case. In swampy, marshy, or boggy soil, an increased thickness of concrete is recommended. But the thickness has nothing to do with the nature of the soil. The thickness depends upon the superstructure—the character of the soil affects the bearing area. This is only one instance of an inadequate treatment of a practical subject. Similar laxity is observed in other cases. This part of the work requires a searching revision,—or it might with advantage be omitted altogether. It is not wanted by the architect, engineer, builder, or contractor, and such information is best sought by those who do require it in special and full treatises. A price-book is best confined to prices. There is room for more than even Laxton gives. For instance, the many new tropical and Colonial woods which are every day being more used should find a place. At present they are quite ignored, and other materials of common use are looked for in vain amongst the 72,000 prices this book contains. On the other hand a good deal of space is now unnecessarily occupied by schedules of old-fashioned joinery now no longer used.

There is no harm in the retention of the Metropolitan Building Act, which might be conveniently illustrated by an outline map showing the area of the operation of the Act and the division of the districts, and the supplementary chapters, including the heads of building contracts, &c., are all useful for reference. The prices throughout the book are high, and for ordinary work will bear a discount of from 10 to 12 per cent., and if the book becomes the acknowledged standard of reference in the Courts of Law, as its compilers desire, the builder and contractor will have no cause to complain.

The Railway and Canal Traffic Act, 1888. By W. A. HUNTER, LL.D., M.P., London: Sweet & Maxwell.

THIS is at once a history of past railway legislation, and a clear and comprehensive exposition of the new Act in relation to the companies' existing Parliamentary powers. Some scores of Acts are quoted, the existing maximum rates being conveniently placed for comparison with the revised classifications and schedules just submitted to the Board of trade. Thus a mass of information, not readily available to any but members of the legal profession, is placed before the public just when particularly useful. With the aid of such a guide, the revised classifications and schedules become much more intelligible, and the study of them a much less formidable task. The author gives particular attention to the "terminals" question, and quotes a large number of cases which have been before the Commissioners, giving *in extenso* their observations upon some of the more prominent (or, as Mr. Hunter regards them, "historical") cases. Extracts are also given from the annual reports of the Inter-State Commerce Commission,—The American body corresponding to our Railway Commission. We notice that they take much the same view of the impracticability of securing a satisfactory "scientific basis" for rates, as that to which we gave expression in our "Notes" last week. The passage in the American report runs as follows:—"The question of the reasonableness of rates involves so many considerations which may at first blush seem foreign, that it is quite impossible to deal with it on purely mathematical principles, or on any principles whatever, without a consciousness that no conclusion which may be reached can by demonstration be shown to be absolutely correct."

The classification of goods is conveniently arranged in alphabetical form at the end of the book It would have been still more instructive if the class in which the respective articles appear in the Railway Clearing-house classification had been also given; for the latter is the acknowledged basis of the new classifications, and as about 80 or 90 per cent. of the articles enumerated remain classed as before, it would be interesting to be able to see at a glance where the few points of variation occur. Probably, however, the author did not have time to make this comparison, as the book was issued within a week or two after the publication of the new classifications. This may also account for such errors as the absence of any italicised words from the terminal clauses on pp. 168, 172, 180 (for which the reader has been particularly directed to keep a look-out!). The index is very elaborate and carefully compiled, full reference being given for every Act or "case" quoted.

RECENT PATENTS.

ABSTRACTS OF SPECIFICATIONS.

4,373, Lavatory Basins and Fittings. T. W. Twyford.

Several modifications of shape are included in the one specification relating to this invention. The principal objects aimed at are:—(1) That the waste passage is free and accessible; (2) that a turned-down edge, which gives a better appearance, is used; (3) shell basins, &c., are used for soap, &c.; (4) the flanged end of the down-pipe is fixed to the main outlet; (5) supporting the wash-basins upon bracket supports faced with a yielding material; and (6) in fixedly securing the lavatories to the supporting brackets. The basin, flange-top, standing waste, overflow shell, supplies, and other parts of the lavatory are cast in one piece of earthenware or metal.

4,868, Stop-cocks and Water-taps. T. Wilson.

According to this invention, in order to prevent leakage, and to render the taps self-closing, the body and socket of the tap is formed as usual, but at the narrow end a slight shoulder or valve-seat is formed, in which is ground a correspondingly shaped conical plug having a passage through the same. A coiled spring is so fixed as to allow the plug to act just in the proper position on turning the thumb-piece, and limits also its action in either opening or closing the tap. A small passage is made in the base of the tap so that the pressure of water tends to force up the conical plug and thus prevent leakage.

5,169, Improved Flooring Cramp. W. Bracewell and W. Hayhurst.

According to this invention, the improvement is in the manner of affixing the cramp to a joist or beam. The levers are also made to clip the joist to prevent any slipping.

5,214, Porous Artificial Stone. W. D. Gooch and others.

According to this invention, porous stone is made in what is termed the dry way. The ingredients, which are sand, asbestos, borax, and litharge, are dried and heated up to a dull red heat, which produces an amalgamation of the particles, and constitutes a stone of a very fine texture, which may be used for various specific purposes.

7,594, Apparatus for Ventilating or Drying. G. H. Elland.

The invention which is the subject of this patent is designed partly with the object of drying or seasoning timber or other substances; but is also applicable for ventilating or warming apartments. In drying timber, it is arranged so that free spaces are left for the passage of air, and beneath the stack is a perforated inlet pipe, which pipe is surrounded by steam or hot-water tubes. The air is thus warmed and passes over the timber, or in other cases through the apartment.

8,963, Manufacturing Bricks and Tiles. W. Sayer.

This invention relates to machinery designed to improve the continuous process of making bricks, tiles, &c., wherein the clay is taken from the pit, mixed, pugged, moulded, cut, and the bricks or tiles removed for drying or burning. In the mechanism waggons or trolleys are run by gravity or propelled one in and one out and automatically switched. Grinding rollers of special pattern are also fitted, and a movable platform supports the barrows, raising them to the service-frame to a suitable level for removal.

NEW APPLICATIONS FOR PATENTS.

Feb. 25.—3,310, J. Young, Window Frames and Sashes.—3,328, W. Budd and others, Draught and Dust Excluders for Doors, &c.—3,332, A. Shaw and J. Parkinson, Ventilating Rooms.—3,339, J. Groom, Heating Buildings, &c.—3,354, A. Ponton and others, Blocks or Bricks.—3,355, W. Hubbard, Wall Tiles, &c.—3,376, J. Becker and W. Winsloe, Apparatus for Whitewashing, Staining, and Painting Ceilings.

Feb. 26.—3,432, O. Brindley, Door-fasteners.—3,466, M. Goldschmidt and A. Michaelis, Water-closets.

Feb. 27.—3,516, A. Ferrett, Facilitating Removal of Sashes for Painting, &c.

Feb. 28.—3,563, H. Lord, Water-closets.—3,580, F. Berry, Electric Bell.—3,595, C. Reeve and J. Hands, Window and Door Fasteners.—3,601, J. Butler, Extracting Cowls for Chimneys.—3,602, E. Cattley, Automatic Sash-fastener.

March 1.—3,653, D. Boyd, Sash-fastener.—3,668, T. Salter, Flushing Apparatus, &c.

March 2.—3,700, J. Deeley, Flushing Cisterns.—3,710, J. Howie, Syphon Cisterns for Flushing Water-closets, &c.—3,729, H. Mansfield, Attachment for Pointing Trowel.—3,741, F. Marshall, Securing Knobs and Handles on Door-spindles.

PROVISIONAL SPECIFICATIONS ACCEPTED.

17,654, A. Green, Gully-trap, &c.—17,959, J. Williamson, Fastening for Doors, &c.—460, A. Johnstone, Mitreing and Cramping Tool.—1,039, A. Randall, Window-sash Fastenings.—1,071, J. Wilkie, Builders' Cramps.—1,138, J. Keeler, Step-ladder Hinges.—1,224, J. Milne, Flushing Apparatus.—1,476, F. and D. Spence, Fire-resisting Materials.—1,485, J. Newcombe, Planing the Mitre of Picture-frames.—1,577, A. Youlten, Sliding Windows.—1,688, A. Withers, Sash-fasteners, &c.—1,742, E. Done and J. Dering, Sash Lifter and Fastener.—2,023, J. Johnson, Rain-water Down-spouts.—2,061, E. Edwards, Holding open Windows in any position.—2,083, W. Thompson, Automatic Door Check and Spring.—2,121, G. Wright, Block, Tile, or Slab for Building, &c.—2,207, J. Day, Flushing Apparatus for Water-closets.—2,289, J. Homan, Fireproof Structures, and Bricks for same.—2,319, R. Livingston, Opening and Closing Casements, &c.—2,374, W. Leggott, Securing Casement Windows.—2,388, R. Fox, Chimney-pots.—2,403, J. Hughes, Decorating Fireproof Material.—2,477, R. Knight, Heating and Ventilating.—2,573, W. Punchard, Depositing Concrete, &c.—2,688, W. Defries and V. Feeny, Hinges.—2,706, E. Edwards, Window-sash Fasteners.—3,057, J. Evans, Fasteners for Window-sashes &c.

COMPLETE SPECIFICATIONS ACCEPTED.

Open to Opposition for Two Months.

2,967, H. Goodridge and S. Fairland, Window-fastenings.—5,502, C. Wittkowsky, Mosaic-work.—6,139, J. Peeter, Roof-plates for Stove-pipes.—6,142, J. Hamblin, Fireplaces.—6,229, T. Twyford, Water-closets.—6,242, W. Dixon and W. Rodgers, Water-closets.—6,261, J. Sellars, Cement.—6,548, T. Helliwell, Glazing, &c.—6,554, T. Palmer, Material for Covering Walls.—6,629, J. Elliott, Roofing Slabs, Tiles, &c.—8,173, W. Phillips and C. Tomlinson, Draught and Weather Excluder for Windows, &c.—13,647, H. Montgomery, Sewer-gas Traps.—17,607, H. Fenlon, Warming Rooms and Buildings.—63, O. Earl, Shop-fittings.—1,221, M. Adams, Gully-traps.—1,332, J. Read, Bakers' Ovens.—1,386, F. Rosentreter and W. Caldwell.—1,520, J. Townshend, Structures Built of Brick.—1,765, L. Brentini, Roofing Tiles.—1,845, L. Wagner, Staircases.

RECENT SALES OF PROPERTY.

ESTATE EXCHANGE REPORT.

[*Contractions used in this list.*—"g.r." for "ground-rent"; "yrs." for "years"; "st." for "street"; "rd." for "road"; "sq." for "square"; "pl." for "place"; "ter." for "terrace"; "yd." for "yard," &c.]

MARCH 4.—By DRIVERS & Co.

Hyde Park Gate—No. 30 and stabling, 49 yrs., g.r. £21	£7,250

By WRATHERALL & GREEN.

Hammersmith—12, 14, and 16, Banim-st., 56 yrs., g.r. £8	420

MARCH 5.—By H. SCRUTON.

Kentish Town—Ground-rents of £24, term 22½ yrs.	290
Stoke Newington—92, Nevill-rd., 71 yrs., g.r. £5	230
101, Nevill-rd., 71 yrs., g.r. £5	230
Hackney—65, Eleanor-rd., 57 yrs., g.r. £3. 5s.	250

By ROGERS, CHAPMAN, & THOMAS.

West Kensington—6 and 28, Vereker-rd., 93 yrs., g.r. £20	1,115

MARCH 6.—By ALDERTON & Co.

Bayswater—45, Porchester-sq., 54 yrs., g.r. £15	1,300

By MORLEY & LEWIS.

Fulham—Broxholme-rd., plot of freehold land	830

By JONES, LANG, & Co.

Regent's Park—1, 2, and 3, Henry-pl., 28 yrs., g.r. £10. 10s.	245

MARCH 7.—By BRADEL & Co.

Bloomsbury—16, Ormond-yd., freehold; 16, New North-st.; and 1, Boswell-ct., 14 yrs., g.r. £70	1,220

By C. P. WHITELEY.

Russell-square—33 and 37, Bernard-st., 5 yrs., g.r. £15. 15s.	350

By DURHAM, GOTTO, & SAMUEL.

Hanslope, Bucks—Hanslope House, and 2 acres, freehold	800

By NEWBON & HARDING.

High Barnet—Freehold cottage and 6½ acres	1,100
Camden Town—1 and 3, Pratt-st., 20 yrs., g.r. £20	400
Holloway—19 and 21, Ringcroft-st., 55 yrs., g.r. £13	650
1, 2, 3, 11, 12, and 13, Madras-pl., 55 yrs., g.r. £36	1,895
City-road—19 and 20, Nelson-ter., 26 yrs., g.r. £7	265
Peckham—135 and 145, Peckham-rye, 26 yrs., g.r. £20	450

By G. F. FRANCIS.

Regent-street—Nos. 238 and 240, 32 yrs., g.r. £60, land-tax £12. 10s.	19,600
Regent's-park—11, Cornwall-ter. and stabling, 31 yrs., g.r. £7	2,650
12 Cornwall-ter. and stabling, 31 yrs., g.r. £7	2,900
Pimlico—9, Graham-st., 32 yrs., g.r. £1	500
9 and 10, Graham-street West, 32 yrs., g.r. £10	700

By BALL, NORRIS, & HADLEY.

Hammersmith, Broadway—A plot of land, with 91 ft. frontage, let at £155 a yr.

Hammersmith-road—Two plots of land, frontage 40 ft., let at £38 a yr.

Wolverton st.—Nineteen plots of land, containing an area of 33,287 ft., let on 90 yrs.' lease, at £135. 17s. 6d. a yr.

MARCH 8.—By EDWIN GILL.

Kilburn—106, Albert-rd., 74 yrs., g.r. £6	270
West Hampstead, Burrard's-rd.—Three plots of freehold land	336

By BAKER & SONS.

Kilburn—15 to 21 odd, Glengall-rd., 96 yrs., g.r. £32	1,240
60, 66, 68, and 70 Glengall-rd., 96 yrs., g.r. £33	1,250
72 to 78 even, Glengall-rd., 96 yrs., g.r. £28	1,240

MEETINGS.

SATURDAY, MARCH 16.

Royal Institution.—The Right Hon. Lord Rayleigh, M.A., F.R.S., on "Experimental Optics (Polarisation: Wave Theory)." IV. 3 p.m.

Glasgow Architectural Association.—Visit to Coats' Memorial Baptist Church, Paisley.

MONDAY, MARCH 18.

Society of Arts (Cantor Lectures).—Mr. Walter Crane on "The Decoration and Illustration of Books." III. 8 p.m.

Surveyors' Institution.—8 p.m.

Victoria Institute.—Rev. J. M. Mello, M.A., on "The Dawn of Metallurgy among Primitive Races." 8 p.m.

Leeds and Yorkshire Architectural Society.—Mr. C. Hadfield on "Canterbury Cathedral." 7.30 p.m.

TUESDAY, MARCH 19.

Institution of Civil Engineers.—(1) Further discussion on Mr. F. J. Waring's paper on "Indian Railways: the Broad and the Narrow-Gauge Systems Contrasted." (2) Mr. C. E. Emery on "The District Distribution of Steam in the United States." 8 p.m.

Society of Arts (Applied Art Section).—M. Carlo Giulano on "The Art of the Jeweller." 8 p.m.

Statistical Society.—Dr. William Ogle, M.A., on "The Alleged Depopulation of the Rural Districts." 7.45 p.m.

Sanitary Institute (Lectures for Sanitary Inspectors).—Professor H. Robinson on "Drainage and Construction." 8 p.m.

Manchester Architectural Association.—Election of Officers. 7.30 p.m.

WEDNESDAY, MARCH 20.

Civil and Mechanical Engineers' Society.—Mr. F. Telford on "The Newmarket Waterworks." 7 p.m.

Royal Meteorological Society.—The President (Dr. W. Marcet, F.R.S.) will deliver an address on "The Sun; its Heat and Light." 7 p.m.

St. Paul's Ecclesiological Society.—Mr. G. H. Birch, F.S.A., on "Round Churches." 7.30 p.m.

British Archæological Association.—(1) Mr. H. Syer Cuming, F.S.A. Scot., on "The Devil's Finger and Toe Nails." (2) Miss Russell on "The name of Glasgow." 8 p.m.

Society of Arts.—Prof. A. B. W. Kennedy, F.R.S. on "Objects and Methods of the Society of Arts' Motor Trials." 8 p.m.

Builders' Foremen and Clerks of Works' Institution.—Ordinary Meeting. 8.30 p.m.

Liverpool Architectural Society.—Special Meeting to consider and pass the Revised Rules. 7 p.m.

THURSDAY, MARCH 21.

Royal Institution.—Professor J. H. Middleton, M.A., on "Houses and their Decoration, from the Classical to the Mediæval Period." 3 p.m.

Society of Antiquaries.—8.30 p.m.

London Institution.—Colonel Gouraud on "The Phonograph." 6 p.m.

Edinburgh Architectural Association.—Mr. J. Wallace on "Neglected Branches of Design." 8 p.m.

FRIDAY, MARCH 22.

Royal Institution.—Mr. E. Muybridge on "The Science of Animal Locomotion in its Relation to Design in Art." 9 p.m.

Institution of Civil Engineers (Student's Meeting).—Mr. H. B. Ransom on "The Cyclical Velocity Fluctuations of Steam and other Engines." 7.30 p.m.

Sanitary Institute (Lecture for Sanitary Inspectors).—Mr. H. P. Boulnois on "Scavenging, Disposal of Refuse, and Sewage." 8 p.m.

SATURDAY, MARCH 23.

Royal Institution.—The Right Hon. Lord Rayleigh, M.A., F.R.S., on "Experimental Optics (Polarisation: Wave Theory)." V. 3 p.m.

Edinburgh Architectural Association.—Visit to Midcalder Church and Calder House.

Miscellanea.

British Archæological Association.—At the meeting of this Association on March 6, Mr. Romilly Allen, F.S.A. Scot., in the chair, the Rev. Canon Routledge reported the results of some antiquarian researches which have recently been made in Canterbury Cathedral by permission of the Dean. The west wall of the crypt is found to be of earlier date than the Norman portions, which are partially built upon it. The hardness of its mortar, and other indications, lead to the supposition that the wall is of Roman date, and part of the ancient church which St. Augustine found on the spot on his arrival at Canterbury. The chairman exhibited one of the sacramental cakes of the ancient Coptic Church. It has a curious pattern of twelve squares, the four central ones being reserved for the clergy. A fine series of drawings and rubbings were exhibited by Mr. Langdon. Mr. Russell Forbes, of Rome, contributed particulars of the excavations on the site of the ancient Basilica of St. Valentine, two miles beyond the Flaminian Gate, Rome. The east ends of the original church have now been laid bare, and also a portion of the nave. The north aisle is the primitive structure erected in the middle of the fourth century, to which a wide nave and south aisle were added on the south side in later times. An old Christian graveyard was then built over, some of the tombs being discovered in recent excavations. There is a recess in the central apse for the priest and the altar here, the older apse being detached from the walls. The tomb of St. Valentine was below the main altar, and the corridor of approach still remains. Mr. Loftus Brock, F.S.A., in reading the paper, in the author's absence, pointed out that this was one of the few churches in Rome that was orientated after the manner usual in England, the axis being very nearly, but not quite, east and west. A paper was then read by Mr. Langdon on the ornamentation of the Cornish crosses. The material is mainly hard granite, and the patterns resemble as nearly as may be those on examples in Ireland, Wales, and the North of England. The examples at St. Teath, Lanherne, Cardynham, and St. Clear, were minutely described.

The Civil and Mechanical Engineers' Society.—The President (Mr. R. E. Middleton) and many of the members and friends of this Society, visited the Nine Elms works of the London and South-Western Railway Company on the 1st instant. They were conducted over the works by Mr. Pettigrew, the manager.

The Cross-Harbour Traffic at Glasgow.—A practical step has at length been taken towards the solution of this question, so long agitating the minds of those concerned. We are informed that the Clyde Trustees view all bridging or tunnelling proposals with distrust, and are prepared to resist certain of these to the utmost, while watching jealously even the least objectionable of them. But in the meantime, they are of opinion that a prompt enlargement of horse-ferry facilities may satisfy the needs of the cross-traffic, and possibly forestall altogether the cry for other modes of transit. Accordingly, through a committee of the body, a resolution has been arrived at to put on, as a first step, a powerful ferry steamer at the Finnieston crossing, situated about one mile below Glasgow Bridge, and halfway to Govan Ferry, which at present is the only crossing for wheeled traffic available within the bounds of the harbour. Details for the intended Finnieston service are not yet complete, but it is likely that the type of boat chosen will be that newly designed by Messrs. Simons & Co., ship-builders, Renfrew, the chief feature of which is a movable traffic deck, accommodating itself to the rise and fall of the tide, and admitting of loading and discharging operations on the level of the quay at all times. There is an alternative plan, the invention of Mr. Drew, consisting in a self-adjusting platform, with special gangways, which is favoured by some of the members, but the power of ultimate decision is left to the committee of management, who are to carry the scheme into operation. The new ferry will be much of the nature of an experiment, and as such is sure to be watched with interest.

London Sanitary Protection Association.—The eighth annual meeting of this Association was held a few days since, at the rooms of the Society of Arts, Adelphi, Captain de Lousada, R.N., in the chair. It appeared from the report that 468 new members had joined during the year, and 454 houses had been inspected for the first time, making the total number examined, since the foundation of the Society in 1881, 3,115. Owing to the increase in the work, the staff had been increased, and there were now five resident inspecting engineers. During the past year an inspection had been made, at a nominal fee, of four large blocks of buildings belonging to the Society for Improving the Condition of the Labouring Classes, and a donation of 10*l.* had been sent to the Mansion House Committee. A table annexed to the report showed that out of the 454 houses inspected for the first time this year, 57 per cent. were either classed as "rather bad," "bad," or "very bad"; 43 per cent. only being "good," "fairly good," or "very good." The balance-sheet showed a sum of about 920*l.* in hand, being the savings of the Association for eight years. The treasurer in his report referred to the fact that one of the objects of the Association is the improvement of the sanitation of the poorer parts of London, and suggested that it might be well to put subscriptions and charges for such philanthropic operations to a separate account. On the motion of the chairman, seconded by Lord Chelmsford, the report was unanimously adopted.

The English Iron Trade.—The English iron market is still in a state of activity, a large amount of business having been transacted during the week, with prices going up. Considerable quantities of pig-iron have been changing hands. The Glasgow warrant market has been very strong and buoyant, and Scotch makers have continued to advance their quotations. Cleveland No. 3 G.M.B. iron has been put up 6d. by makers, and other districts have followed with advances ranging from 6d. to 1s. per ton. Bessemer pig in the north-west is also 6d. dearer. Finished iron has been raised this week 5s. a ton in the North of England, and it is somewhat difficult to state the prices of steel, which are everywhere tending upwards, with manufacturers unwilling to bind themselves. Shipbuilders have not received any fresh orders this week, but it is a satisfactory sign that they are still engaging fresh hands. Engineers continue very busy.—*Iron.*

Festive.—The annual dinner and smoking-concert of the staff of the well-known builder and contractor, Mr. John T. Chappell, of 149, Lupus-street, Pimlico, S.W., and Brighton, took place on Saturday evening last at the Holborn Restaurant, and was numerously attended. The chair was taken by Mr. C. H. Chappell, and a very enjoyable evening was spent. The toast of "The Firm" was very heartily received.

The Peabody Fund.—The twenty-fourth annual Report of the Trustees of the Peabody Donation Fund (for the year 1888) has just been issued. The trustees report that the net gain of the year, from rents and interest, has been 29,611*l.* 11s. 2d. The sum given and bequeathed by Mr. Peabody was, in 1862, 150,000*l.*; in 1866, 100,000*l.*; in 1868, 100,000*l.*; and in 1873, 150,000*l.*; making a total of 500,000*l.*; to which has been added money received for rent and interest, 465,182*l.* 7s. 9d., making the total fund on the 31st of December last 965,182*l.* 7s. 9d. Of the 390,000*l.* borrowed of the Public Works Loan Commissioners and others, mentioned in previous reports, the Trustees have paid off 128,666*l.* 13s. 4d., leaving a balance unpaid of 261,333. 6s. 8d. In addition to this, the Bank of England has advanced the sum of 10,000*l.*, so that the total indebtedness of the Trustees at the end of the year was 271,333*l.* 6s. 8d. Within the past year the Trustees have expended on land and buildings 13,064*l.* 3s. 4d., making the total expenditure to the end of the year 1,232,283*l.* 19s. 11d. The three new blocks of buildings on the Pimlico estate, referred to in the last report, were completed in November, and are now fully occupied. Up to the end of the year, the Trustees have provided for the artisan and labouring poor of London 11,275 rooms, besides bath-rooms, laundries, and wash-houses, occupied by 20,413 persons. These rooms comprise 5,071 separate dwellings, say 76 of four rooms, 1,789 of three rooms, 2,398 of two rooms, and 808 of one room. The nature of the occupation of the head of each family is set forth in a table which accompanies the report. It is stated that the average weekly earnings of the head of each family in residence at the close of the year was 1*l.* 3s. 9d. The average rent of each dwelling was 4s. 9½d. per week, and of each room 2s. 2d. The rent in all cases includes the free use of water, laundries, sculleries, and bath-rooms. The birth-rate for the year in the Peabody dwellings reached 39·61 per 1,000, which is 8·91 per 1,000 above that of all London for the same period. The death-rate, including the deaths of fifty-nine inhabitants of the buildings who were removed to hospitals, was 18·47 per 1,000, which is the same as that of London. The infant mortality was 126·87 in each 1,000 births, or 19·57 below that of London. The actual number of births and deaths are from returns furnished by the District Registrars, and the calculations have been checked and confirmed at the General Register Office, Somerset House. Mr. J. Crouch is the Secretary of the Fund, and the offices are at 64, Queen-street, Cheapside.

Tenth Annual Exhibition of Meteorological Instruments.—At the ordinary meeting of the Royal Meteorological Society, to be held, by permission of the Council of the Institution of Civil Engineers, at 25, Great George-street, Westminster, on Wednesday next, the 20th inst., Dr. W. Marcet, F.R.S. (President), will deliver an address on "The Sun,—its Heat and Light," which will be illustrated by experiments. After the reading of this address the meeting will be adjourned, in order to afford the Fellows and their friends an opportunity of inspecting the exhibition of actinometers and solar radiation apparatus, and of such new instruments as have been invented and first constructed since the last exhibition. The exhibition will, at the request of the Secretary of the Institution of Civil Engineers, be open in readiness for their meeting on Tuesday evening, the 19th instant, and will remain open till Friday, the 22nd instant.

Architectural Association Surveying Class.—This class is to be formed for the study of surveying, under the direction of Mr. A. T. Walmisley as Instructor, who will give seven lectures during the session on Surveying, each of which will be followed by a field lesson on Hampstead Heath. In consequence of increased demands on his time professionally, Mr. Walmisley will be unable to personally superintend the field lessons, which will be conducted by Mr. F. W. Quick as Demonstrator. Mr. Walmisley will at the conclusion of the course give four additional indoor lectures on special instruments. The class will not be formed unless ten members have given their names to the Secretary, Mr. C. E. Pinks, 21, Parliament-street, before the end of May.

Sewerage and Drainage, Leighton Buzzard.—We hear that the Rural Sanitary Authority of Leighton Buzzard have instructed Mr. J. C. Melliss, C.E., to prepare a scheme for the drainage, sewage disposal, and water-supply of the town.

The Arts and Crafts Exhibition Society.—The Arts and Crafts Exhibition Society has taken permanent offices at No. 45, Great Marlborough-street, W., and is busy preparing for another Exhibition. Mr. Arthur Crane remains President, and Mr. Ernest Radford has been re-elected to the Secretaryship. The Society has already more than doubled its membership of last year, and from all we hear it bids fair to become a thoroughly representative body. The Secretary will be glad to supply all information about its aims and objects. At a meeting of the Society held on February 27, the following new members were elected, viz., Messrs. John Belcher, J. F. Bentley, R. T. Blomfield, Madox Brown, B. Creswick, Conrad Dressler, Henry Holiday, Herbert Horne, Holman Hunt, Selwyn Image, George Jack, J. Erskine Knox, A. H. Mackmurdo, Audley Mackworth, Ernest Newton, William Niven, F. W. Pomeroy, Halsey Ricardo, T. M. Rooke, George Simonds, R. Spencer Stanhope, J. M. Strudwick, Hamo Thornycroft, and Christopher Whall; Miss Kate Faulkner, Mrs. de Morgan, and Miss Mary Morris.

"Cum Marte Minerva."—On Monday, the 25th inst., the new drill-hall and headquarters of the 20th Middlesex (Artists') Rifle Volunteers will be formally opened by T.R.H. the Prince and Princess of Wales. The buildings have been erected, at a total cost of 6,500*l.*, from the designs of the commanding colonel, Robert W. Edis, F.S.A. and L.C.C. They are situated in Duke's-road, Euston-road, at the rear of St. Pancras parish church. Nearly one-half of the expense has been subscribed by members of the regiment.

The Pelican Club.—We are informed that Messrs. Perry & Co.'s tender has been accepted for erecting the new Pelican Club, Gerrard-street, Shaftesbury-avenue. Messrs. Martin & Purchase are the architects.

PRICES CURRENT OF MATERIALS.

TIMBER.	£. s. d.	£. s. d.
Greenheart, B.G. ....ton	6 10 0	7 10 0
Teak, E.I.....load	10 0 0	13 0 0
Sequoia, U.S.....foot cube	0 2 3	0 3 0
Ash, Canada.....load	3 10 0	5 0 0
Birch ,, ...	3 10 0	6 0 0
Elm ,, ...	4 0 0	5 0 0
Fir, Dantsic, &c.	2 0 0	4 0 0
Oak ,, ...	2 10 0	4 10 0
Canada	5 10 0	7 10 0
Pine, Canada red	3 5 0	4 0 0
,, yellow	3 10 0	5 10 0
Lath, Dantsic.....fathom	4 10 0	5 10 0
St. Petersburg.....	5 0 0	6 10 0
Wainscot, Riga, &c.....log	2 15 0	4 5 0
,, Odessa, crown.....	0 0 0	0 0 0
Deals, Finland, 2nd and 1st...std.100	9 10 0	11 0 0
,, ,, 4th and 3rd.....	8 0 0	9 0 0
Riga	7 10 0	9 0 0
St. Petersburg, 1st yellow	11 10 0	15 0 0
,, 2nd ,, ...	10 0 0	11 0 0
,, white	9 10 0	10 10 0
Swedish	9 0 0	16 0 0
White Sea	9 10 0	17 0 0
Canada, Pine, 1st	16 0 0	26 10 0
,, ,, 2nd	11 0 0	17 10 0
,, ,, 3rd, &c.	8 0 0	10 10 0
,, Spruce, 1st	9 10 0	11 0 0
,, ,, 3rd and 2nd	7 10 0	9 10 0
New Brunswick, &c.	6 15 0	8 15 0
Battens, all kinds	6 10 0	20 0 0
Flooring Boards, sq., 1 in., prepared, First	0 11 0	0 14 6
Second	0 8 0	0 10 9
Other qualities	0 5 6	0 7 9
Cedar, Cuba.....foot	0 0 4½	0 0 4½
Honduras, &c.....	0 0 4	0 0 4½
Mahogany, Cuba	0 0 4½	0 0 6½
St. Domingo, cargo average	0 0 4½	0 0 6½
Mexican ,, ...	0 0 4½	0 0 5½
Tobasco ,, ...	0 0 5½	0 0 6½
Honduras ,, ...	0 0 5½	0 0 6½
Box, Turkey .....ton	4 0 0	12 0 0
Rose, Rio.....	15 0 0	20 0 0
Bahia	14 0 0	18 0 0
Satin, St. Domingo .....foot	0 0 6	0 1 3
Porto Rico	0 0 9	0 1 3
Walnut, Italian	0 0 4½	0 0 6½

METALS.		
IRON—Bar, Welsh, in London...ton	5 5 0	5 10 0
,, ,, at works in Wales ...	4 15 0	5 0 0
,, Staffordshire, in London ...	5 10 0	6 10
COPPER—		
British, cake and ingot..... ton	59 0 0	61 0 0
Best selected	60 0 0	62 0 0
Australian	0 0 0	0 0 0
Chili, bars	55 10 0	56 0 0
YELLOW METAL.....lb.	0 0 6½	0 0 7½
LEAD—Pig, Spanish .....ton	12 12 6	0 0 0
English, common brands	12 17 6	0 0 0
Sheet, English.....	0 0 0	0 0 0
SPELTER—		
Silesian, special .....ton	17 5 0	17 7 6
Ordinary brands.....	17 2 6	17 5 0
TIN—		
Banca .....ton	98 0 0	0 0 0
Billiton.....	97 0 0	0 0 0
Straits	94 15 0	0 0 0
Australian	96 0 0	0 0 0
English Ingots.....	97 0 0	97 10 0
ZINC—English sheet .....ton	21 0 0	22 0 0

OILS.	£. s. d.	£. s. d.
Linseed .....ton	18 7 6	18 12 6
Cocoanut, Cochin	27 0 0	34 0 0
Ceylon	25 10 0	0 0 0
Palm, Lagos	25 0 0	0 0 0
Rapeseed, English pale	28 10 0	0 0 0
,, brown	27 0 0	0 0 0
Cottonseed, refined	24 0 0	0 0 0
Tallow and Oleine	19 0 0	45 0 0
Lubricating, U.S.	5 0 0	6 0 0
,, refined	7 0 0	12 0 0
TAR—Stockholm .....barrel	1 2 0	1 2 6
Archangel	0 14 0	0 14 6

TENDERS.

[Communications for insertion under this heading must reach us *not later than* 12 *Noon on Thursdays.*]

AUDENSHAW.—For a cotton wadding mill at Audenshaw, for Major Lingard. Mr. J. H. Burton, architect, Warrington-street, Ashton-under-Lyne:—

Hannah Fielding, Droyladen	£1,480 3 6
Charles Genney, Manchester	1,472 18 8
Zachariah Pike, Hooley Hill.....	1,394 4 0
Joseph Clayton, Denton.....	1,384 10 0
Thomas Storer, Denton	1,350 0 0
Washington Hurst, Droyladen	1,349 0 0
Thomas Warrington, Hyde	1,344 14 0
Garside, Barnes, & Co., Stalybridge	1,310 0 0
Henry Gardener, Ashton-under-Lyne	1,276 13 6
Charles Morris, Ashton-under-Lyne	1,273 10 6
J. W. Williamson, Ashton-under-Lyne.....	1,266 0 0
Joseph Lowe, Hooley Hill	1,264 2 10
Allen Holmes, Ashton-under-Lyne	1,260 0 0
Jabez Gibson, Dukinfield	1,260 0 0
Joshua Garside, Ashton-under-Lyne	1,256 0 0
Clement Wallworth, Gorton.....	1,250 0 0
Thomas Dean, Ashton-under-Lyne...	1,230 0 0
Ralph Whitell, Manchester	1,229 0 0
W. & S. Miles, Stalybridge	1,225 17 6
John Bromley, Oldham	1,225 8 0
Joseph Davison, Manchester.....	1,224 0 0
John Robinson, Ashton-under-Lyne*	1,195 0 0
Robert H. Booth, Stalybridge.....	1,047 10 0

* Accepted.

BRIGHTON.—For road and sewer, The Drive, West Brighton, on the Stanford estate. Mr. Charles Nye, engineer, 38, Duke-street, Brighton:—

J. Longley & Co.	£1,295 0 0
J. Parsons & Sons	1,215 1 10
J. Harrison & Son	1,200 0 0
J. J. Clark.....	1,108 0 0

CANTERBURY.—For alterations and additions to Salvation Army Barracks buildings, at Canterbury, for General Booth. Mr. J. Williams Dunford, architect, 101, Queen Victoria-street, London:—

Dene & Son, Deal	£815 0 0
Coxhead, Leytonstone	559 0 0
Martin, Battersea	550 0 0
Amos & Foad, Whitstable	499 10 0
Terry & Son Canterbury	493 0 0
W. H. Wiles, Sittingbourne.....	326 0 0

COLCHESTER.—For alterations and additions to Hythe Hill House. Mr. J. W. Start, architect, Cupa-chambers, Colchester:—

R. Beaumont.....	£173 0 0
T. J. Ward	162 0 0
A. Chambers (accepted)	146 0 0

[All of Colchester.]

GOOLE.—For alterations and additions to Salvation Army Barracks at Goole, for General Booth. Mr. J. Williams Dunford, architect, 101, Queen Victoria-street London:—

J. W. Jackson, Goole	£410 10 0
Jackson Bros., Goole.....	390 0 0
A. E. W. Shearsmith, Swinefleet	378 7 6
J. Welch, Stockton	378 0 0
F. Grant, Grimsby	366 0 0
T. H. Burnett, Grimsby (accepted)...	358 0 0

HARROGATE (Yorkshire).—For alterations and additions at the Adelphi Hotel. Messrs. Morley & Letts, architects, 185, Earl's Court-road, London:—

Ives & Co., Shipley (accepted)	£1,105 0 0

HARROW.—For erecting two houses at Wealdstone, for Mr. G. H. Basley. Mr. Johnson, architect:—

Waterman, Watford	£1,145 0 0
Dunkley, Willesden	939 10 0
Beechener, Wealdstone.....	937 10 0
Gullett Bros., Wealdstone*	927

* Accepted.

HORNSEY.—For furnaces, &c., for refuse treatment at the Hornsey Local Board's New Sanitary Depôt, Hornsey. Mr. T. de Courcy Meade, Engineer:—

Piercy & Co., Birmingham	£3,850 0 0
W. Neil, Bow, E.	4,987 10 0
Crompton & Compton, 19, Grace-street, E.C.	4,129 0 0
Wailes & Co., 258, Euston-road, N.W.	3,423 5 3
W. Horsfall, Leeds	3 124 0 0
Whitford & Co., Millwall, E.	2,897 10 0
A. D. Dawnay, London Bridge House, E.C.	2,784 0 0
Goddard, Massey, & Warner, Nottingham (accepted).....	2,687 0 0

HORNSEY.—For levelling and making up Muswell-hill-road, for the Hornsey Local Board. Mr. T. de Courcy Meade, Engineer:—

Dickson, St. Albans	£1,197 0 0
Aspinall & Sons, Finsbury-park	1,050 0 0
Dunmore, Crouch-end.....	1,040 0 0
Mowlem & Co., Westminster	997 0 0
Willmott & Sons, Hitchin	952 0 0
Piercy, Hornsey.....	933 0 0
Cooke & Co., Battersea	914 0 0
Jackson & Son, Finsbury-park.....	899 0 0
T. Adams, Kingsland	814 0 0
A. Walker, Upper Holloway*	787 0 0

* Accepted.

CONTRACTS AND PUBLIC APPOINTMENT.

Epitome of Advertisements in this Number.

CONTRACTS.

Nature of Work, or Materials.	By whom Required.	Architect, Surveyor, or Engineer.	Tenders to be delivered.	Page.
Kentish Rag Stone Paving	Southend Local Board	P. Dodd	Mar. 19th	ii.
Kerbing, Tarpaving, &c.	Lewisham Bd. of Wks	*Official*	do.	ii.
Annual Contracts	do.	do.	do.	ii.
Brickwork Sewers, &c., North Woolwich	Met. Board of Works	do.	Mar. 22nd	ii.
Valve Houses, &c.	Liverpool Corporation	G. F. Deacon	Mar. 25th	ii.
General Paving Works	West Ham Council	Lewis Angell	Mar. 26th	ii.
Broken Guernsey Granite	do.	do.	do.	ii.
Timber for Packing Cases	Sec. of State for India	*Official*	do.	xi.
York Paving, Granite Kerb, Channelling, &c.	St. Mary (Battersea) Vestry	J. T. Pillitch	do.	xi.
Earthenware Pipe Sewers, &c.	West Bromwich Corp.	J. T. Bayes	Mar. 27th	ii.
Broken Granite and Stone Slags	Ramsey Local Board	*Official*	Mar. 29th	ii.
Battery, Tenby	Admiralty	do.	do.	ii.
Limestone Footway Pavements	Birmingham Public Works Committee	W. S. Till	Mar. 30th	xi.
New Road and Culvert, Windsor		T. V. H. Davison	do.	ii.
Making-up Roads	Beckenham Local Bd.	G. B. Carlton	April 1st	ii.
Drainage Works at Schools	St. Marylebone Guar	H. S. Sell & Son	do.	xi.
Station Buildings, Platforms, &c.	L. & N.W. & G.W. Jt Ry	*Official*	April 3rd	ii.
Fire Telegraphs	West Ham Council	Lewis Angell	April 9th	xi.
New Steel Bridge, &c.	Portland Ferry Bridge Commissioners	Sir John Coode	April 13th	xi.
Church, South of London		J. Cubitt	Not stated.	xi.
Barracks Buildings and Alterations	Salvation Army	J. W. Dunford	do.	ii.
Erection or Enlargement of Schools	School Bd. for London	*Official*	do.	xi.
Annual Repairs to Buildings and Furniture	do.	do.	do.	xi.
Galvanised Iron Dustbins	do.	do.	do.	xi.
Repairing and Cleaning various Schools, &c.	do.	do.	do.	xi.
Works and Materials, Chatham	War Department	do.	do.	ii.

PUBLIC APPOINTMENT.

Nature of Appointment.	By whom Advertised.	Salary.	Applications to be in.	Page.
Surveyor and Engineer	Brentford Local Board	200*l.*	Mar. 19th	xvi.

HORNSEY.—For the supply and erection of about 750 feet of 4 ft. wrought-iron fencing, for the Hornsey Local Board. Mr. T. de Courcy Meade, Engineer:—

	s. d.	
Bailey & Grundy, Amberley-road, Paddington	11 10	per yard run!
G. B. Smith & Co., Glasgow	10 0	,,
J. Elwell, Birmingham	8 6	,,
Steven Bros. & Co., 4, Upper Thames-street, E.C.	7 10	,,
Bayliss, Jones, & Bayliss, 139 and 141, Cannon-street, E.C.	7 7	,,
Newton, Chambers, & Co., near Sheffield	7 7	,,
G. Rowe, Edmonton	7 6	,,
Goddard, Massey, & Warner, Nottingham	7 0	,,
Economic Fencing Co., 122, Cannon-street, E.C.	6 10	,,
Johnson Bros., 6, Waterloo-place, S.W. (accepted)	5 9	,, !

HORNSEY.—For brick culvert, &c., Middle-lane, Hornsey, for the Hornsey Local Board. Mr. T. de Courcy Meade, Engineer:—

Jackson & Sons, Finsbury-park	£449 0 0
B. Cooke & Co., Battersea	441 0 0
J. Fizzey, Hornsey	414 0 0
Dickson, St. Albans	407 0 0
Dunmore, Crouch-end	405 0 0
T. Adams, Kingsland	381 0 0
Willmott & Sons, Hitchin (accepted)	353 0 0

HORNSEY.—For various works for the Hornsey Local Board, for one year, from March 26, 1889. Mr. T. de Courcy Meade, Engineer:—

Name and Address of Accepted Contractor.	Nature of Contract.	
T. Hayhoe, Highgate W. Harris, Muswell hill	Repairing picks, &c.	At per Schedule.
E. & F. Wright, Mile-End, New Town	Ironwork	Do.
Docwra & Sons, Ball's Pond	Stand-post work	Do.
J. Marks, Crouch-End	Fire-hydrant pits	£1. 15. 6d. each.
Pardell & Co., Wood Green	Street Watering and General Cartage Work	At per Schedule.
Jackson & Sons, Finsbury Park	Scavenging and Dusting	£999.
Pardell & Co., Wood Green	Street cleansing	£846.

[*Note.*—Contract for "Mason's and Pavior's work" referred to a committee for consideration.]

KINGSWEAR (Devon).—For additions and alterations to Sea View Villa, Kingswear, for Mr. Charles Seale Hayne, M.P. Mr. E. H. Back, architect. Quantities by architect:—

Henley & Grant, Dartmouth	£689 0 0
Pillar & Sons, Dartmouth	685 0 0
Maunder & Veale, Dartmouth	668 0 0
F. W. Vanstone,* Paignton	628 0 0

* Accepted.

LEWISHAM.—For improvements at the "Sir David Brewster" tavern, Court Hill-road, Lewisham. Mr. W. A. Lewcock, architect, 88, Bishopsgate-street Within, E.C.:—

Balaam Brothers	£275 0 0
Ivory	233 0 0
Spencer & Co.	220 0 0
Stephenson	169 0 0
Dawes	163 0 0
Champion	158 0 0
Dean	155 0 0

LONDON.—For alterations and repairs at the "Princess Alexandra" public-house, for Mr. Fletcher. Mr. Treacher, architect:—

Walker	£405 0 0
Buckholder	330 0 0
Bryant	295 12 0
Schlater	293 0 0

LONDON.—For the erection and completion of the Ormonde Club premises, in Walworth-road, S.E., for Mr. F. Crichton Temple. Mr. C. H. Flack, architect, 9, Bedford-row, W.C.:—

	Club.	Arch.	
Manley	£2,436	£382	£2,818
Balaam Bros.	2,305	342	2,647
Sawyer	2,341	299	2,640
Patman & Fotheringham	2,300	270	2,570
Jackson & Todd	2,179	345	2,524
Woodward	2,260	225	2,485
Burman Bros.	2,090	300	2,390
W. Downs	2,110	270	2,380
J. & J. Greenwood	2,111	249	2,360

LONDON.—For the erection of Wesleyan Mission Hall at Streatham, S.W. Mr. Frederick Wheeler, architect, 22, Chancery-lane, W.C. Quantities by Messrs. Evans & Deacon, 1, Adelaide-street, Charing-cross, S.W.:—

Hill Bros.	£1,185 0 0
W. Thomas	1,171 0 0
G. Jervis Smith	1,140 0 0
F. & H. F. Higgs	1,140 0 0
J. Holloway*	1,098 0 0

* Accepted subject to reduction.

LONDON.—For alterations and additions to No. 96, Upper-street, Islington. Mr. Edmund J. Harrison, architect, 72, Chancery-lane, W.C.:—

R. Fullbrook	£578 10 0
T. Andrew	436 0 0
Wall Bros.	429 0 0
D. Davies (late)	383 19 0
H. Baylis (accepted)	348 10 0

LONDON.—For sundry repairs and decoration at the addresses named. Mr. Edwin T. Hall, architect, 57, Moorgate-street, E.C.:—

54, Finsbury-pavement.

Heeps	£530 0 0
Woodward (accepted)	452 0 0

136, High-street, Notting Hill.

Pearson	270 0 0
Adams (accepted)	191 11 0

5, Stanhope-place, W.

Bartholomew & Co.	294 0 0
Foster & Dicksee (accepted)	223 0 0

LONDON.—For the erection of five shops at Lavender-hill, S.W. Mr. Frederick Wheeler, architect, 22, Chancery-lane, W.C.:—

J. Holloway	£4,670 0 0
J. E. J. Thorpe	3,870 0 0
Scott & Deryck	3,750 0 0
G. Jervis Smith (accepted)	3,570 0 0

LONDON.—For the construction of roads and sewers, Prince's Estate, Battersea, S.W. Mr. Frederick Wheeler, architect, 22, Chancery-lane, W.C.:—

		Without Curb.
J. Neal	£1,575	£1,292
R. & G. Neal, Limited	1,474	1,213
T. Blockmore	1,420	1,201
R. Mayo (accepted)	1,345	1,100

LONDON.—For fitting up two floors of premises at the corner of Denman-street, Shaftesbury-avenue, for trade purposes. Messrs. N. S. Joseph & Smithem, 45, Finsbury-pavement, architects:—

W. Scrivener & Co.	£1,182 0 0
M. Patrick & Son	1,094 0 0
G. Cells	1,040 0 0

LONDON.—For rebuilding Nos. 9 and 10, Nicholl-square, E.C. Messrs. N. S. Joseph & Smithem, 45, Finsbury-pavement, architects:—

G. S. Williams & Son	£2,428 0 0
Ashby Bros.	2,411 0 0
Patman & Fotheringham	2,173 0 0

LONDON.—For sanitary alterations and decorating work at No. 11, Eaton-square, Pimlico, for Mr. H. Gatliff. Mr. Newmarch, surveyor. Quantities supplied:—

Brewer	£900 0 0
Patman & Fotheringham	863 0 0
Lawrence	834 0 0
Bush	833 0 0
N. Lidstone	835 0 0

LONDON.—For alterations and additions at No. 8, Kensington Park-road, W., for Dr. W. M. Nott. Mr. Newmarch, surveyor. Quantities supplied:—

Patman & Fotheringham	£825 0 0
Lawrence	718 0 0
N. Lidstone	705 0 0
Brewer	696 0 0
Dowsing	675 0 0

LONDON.—For warming the school in Horseferry-road, Westminster, on the low-pressure hot-water system, for the School Board for London. Mr. T. J. Bailey, architect:—

Robert Crane (accepted)	£300 0 0

[Full list given in last week's *Builder*, p. 194.]

LONDON.—For general repairs, decorating, and new drainage at No. 3, Nevern-road, Earl's Court, W., for Mr. A. J. Hamilton. Mr. Edgar H. Selby, architect and surveyor, 26, Craven-street, Charing-cross, W.C.:—

T. W. Heath	£335 13 3
J. Rugg	244 0 0
R. Eddis	231 3 0
Toten & Sons (accepted)	227 0 0

LONDON.—For fitting offices at 219, Upper Thames-street, and 99, Queen Victoria-street, the same being an extension of the International Headquarters of the Salvation Army, for General Booth. Mr. J. Williams Dunford, architect, 101, Queen Victoria-street, E.C.:—

A. Martin, Battersea (accepted)	£513 0 0

LONDON.—For improvements at "The Talbot" tavern, Clarendon-road, Notting-hill. Mr. R. A. Lewcock, architect, 88, Bishopsgate-street Within, E.C.:—

A. Davies (accepted)	£246 0 0
Pewtering.	
S. Heath (accepted)	124 0 0

LONDON.—For improvements at "The Duke of York" Tavern, Salmon's-lane, Stepney. Mr. R. A. Lewcock, architect, 88, Bishopsgate-street-within, E.C.:—

G. Stephenson (accepted)	£546 0 0

LONDON.—For works at "The Sun Dial," Goswell-road, E.C. Mr. R. A. Lewcock, architect, 88, Bishopsgate-street-within, E.C.:—

Spencer & Co.	£340 0 0
Hunt	325 0 0
Balaam Bros.	311 0 0
Ivory	310 0 0

MANCHESTER.—For erecting Davyhulme Church-Manchester. Mr. George Truefitt, architect, 5, Bloomsbury-square, London:—

	Church Complete.			A*		
Rowbotham	£3,300	0	0	£4,400	0	0
Haywood	4,697	14	4	4,096	8	0
Brown & Son	4,400	0	0	3,920	0	0
Neill & Son	4,210	0	0	3,737	0	0
Hamilton	4,220	0	0	3,720	0	0
Wilson, Toft, & Huntley	3,969	0	0	3,529	0	0
Southern & Sons	3,920	0	0	3,470	0	0

* If internal walls are finished stucco instead of with stone.

MANCHESTER.—For alterations and additions to Salvation Army Temple, Grosvenor-street, Manchester, for General Booth. Mr. J. Williams Dunford, architect, 101, Queen Victoria-street, London:—

T. Swarbrick	£1,000 0 0
W. Dollen	965 0 0
J. Swallow	960 0 0
W. Thorpe	915 0 0
F. & E. Haynes	900 0 0
S. Chestham	897 0 0
Wm. Holt	897 0 0
A. Martin, Battersea*	893 0 0
C. Taylor & Son	886 0 0
O. Williams	829 0 0
A. Lyall	817 10 0
W. H. Harrison	800 0 0
W. Shaw	796 0 0
W. Cox	784 0 0
W. Maben	779 0 0
Ross & Wood	777 0 0
F. J. Coxhead, Leytonstone*	693 0 0
C. Genney	688 7 0

* The rest of Manchester.

MIDDLEWICH (Cheshire).—For the erection and completion of Salvation Army Barracks buildings, at Middlewich, Cheshire, for General Booth. Mr. J. Williams Dunford, architect, 101, Queen Victoria-street, London:—

Mickleburgh & Wright, Crewe	£654 10 0
Haynes, Manchester	640 0 0
Martin, Battersea	585 0 0
Cotterill, Crewe	574 12 0
Beckett, Hartford	567 0 0
Rylance & Taylor, Northwich	564 10 0
Stelfox & Carter, Northwich	521 13 0
Meller, Sandbach	488 10 0
Matthews, Nantwich	485 0 0
Coxhead, Leytonstone	473 0 0
Clarke & Son, Middlewich	470 0 0
Hamlet & Son, Winsford	460 10 0
Hulse, Winsford	420 10 0

MAIDENHEAD (Berks).—For the erection of a residence and stabling, Maidenhead Court Estate. Mr. Frederick Wheeler, architect, 22, Chancery-lane, London. Quantities by Messrs. Evans & Deacon, 1, Adelaide-street Charing-cross, S.W.:—

Luscombe & Son	£7,400 0 0
Goddard	6,050 0 0
Foster & Dicksee	5,996 0 0
Maides & Harper	5,978 0 0
J. Freeman	5,830 0 0
J. Shillitoe & Son	5,475 0 0
G. Jervis Smith	5,298 0 0
T. Nye	4,995 0 0
G. H. Gibson (accepted)	4,943 0

MAIDENHEAD (Berks).—For the erection of billiard room, &c., to Maidenhead Court Estate. Mr. Frederick Wheeler, architect, 32, Chancery-lane, London :—
G. H. Gibson, High Wycombe*..... £947 10 0
*Accepted.

PLUMSTEAD (Kent).—For erection of brick boundary and retaining walls, iron and oak fencing to enclose land intended to be used as a cemetery for the parish of Plumstead. Mr. Henry H. Church, architect, Woolwich. Quantities supplied :—

Co-operative Builders' Society (Lim.)	£3,400	0	0
Kirk & Randall	3,300	0	0
Caplen & Redgrave	3,188	0	0
Staines & Son	3,144	0	0
Rackham & Bentham	3,134	0	0
King Brothers & Co.	3,056	0	0
Battley	2,952	0	0
Potter	2,890	0	0

PLUMSTEAD (Kent).—For sewers in the Strand Field, High-street, Plumstead. Mr. Henry H. Church, architect, Woolwich :—

Covil	£205	0	0
Coombs	185	0	0
Rackham & Bentham	174	14	8
For side Entrances, each.			
Coombs	£60	0	0
Covil	55	0	0
Rackham & Bentham	43	18	0

SEVENOAKS.—For the erection of a club-house and large hall for the Directors of the Sevenoaks Constitutional Club Company, Limited. Mr. T. Potter, architect, Sevenoaks. Quantities supplied :—

	Club.	Vestibules, Hall, Drainage, &c.,	Total.
	£	£	£
Langdale, Hallett, & Co., London	3,092	2,150	645	5,887
E. Bevan, Sevenoaks	2,559*	1,616†	572‡	4,747§
Maides & Harper, Croydon	2,498	1,597	559	4,654
Pryer & Co., Maidstone	2,465	1,480	551	4,496
Arnaud & Son, Bromley	2,365	1,427	544	4,336
R. Dartnell, Brasted	2,250	1,440	510	4,200
Wallis & Sons, Maidstone	2,180	1,390	512	4,082
W. Wiltshire, Sevenoaks (accepted)	2,179	1,328	487	3,994

* Add 4s. 6d. † Add 1s. 7d. ‡ Add 8s. 9d. § Add 10d.
[The above estimates do not include heating or terra-cotta dressings.]

SHIRLEY (near Croydon).—For erecting village club, for the Rev W. Wilks, M.A. Messrs. St. Aubyn & Wadling, architects :—
Smith & Bulled,* West Croydon £850
* Accepted revised tender.

STREATHAM.—For building three shops, for Mr. R. L. Freeborn :—
Walter Francis, Dulwich (accepted) £2,250 0 0

WOLVERHAMPTON.—For the erection of eight cottage homes, schools, storerooms, superintendents' residence and office, entrance lodge, workshops, roads, &c., at Wednesfield, near Wolverhampton, for the Guardians of the Wolverhampton Union. Mr. Geo. H. Stanger, North-street, Wolverhampton, architect. Quantities supplied by the architect :—

J. Shillitoe & Son, Bury St. Edmunds	£20,000	0	0
J. Inwood, Malvern	18,595	0	0
J. Biggs, Hockley, Birmingham	18,000	0	0
Wm. Willetts, Old Hill, near Dudley	17,957	0	0
B. Guest, Wolverhampton	17,811	13	0
Thos. Tildesley, Willenhall	17,529	0	0
C. Ford & Sons, Wolverhampton	17,389	0	0
C. A. Horton, Brierley Hill	17,263	0	0
Wm. Bissett & Sons, Sheffield	17,009	0	0
Lovatt & Co., Wolverhampton	16,312	0	0
Hy. Willcock, Wolverhampton	16,020	0	0
E. Gabbutt, Liverpool	15,700	0	0
J. Jones & Sons, Wolverhampton	15,500	0	0
J. Bradney & Co., Wolverhampton*	14,691	0	0

[Architect's estimate, £15,522.]
* Accepted.

WOOLWICH.—For re-building out-offices and additional storey on house, 88, Powis-street, Woolwich. Mr. Henry H. Church, architect, Woolwich :—
Covil (accepted) £240 0 0

WOOLWICH.—For additions to shop, 101, Powis-street, Woolwich. Mr. Henry H. Church, architect, Woolwich :—
Covil (accepted) £175 0 0

TO CORRESPONDENTS.

R. V.—H. H.—G. & S. (shall have attention).—J. M.—M. H. J.—A. W.—J. H. M. (thanks for pamphlet).—W. A. B. (list of tenders received too late for this week).—G. H. F. P. (too late).

All statements of facts, lists of tenders, &c. must be accompanied by the name and address of the sender, not necessarily for publication.

We are compelled to decline pointing out books and giving addresses.

NOTE.—The responsibility of signed articles, and papers read at public meetings, rests, of course, with the authors.

We cannot undertake to return rejected communications.

Letters or communications (beyond mere news-items) which have been duplicated for other journals, are NOT DESIRED.

All communications regarding literary and artistic matters should be addressed to THE EDITOR; all communications relating to advertisements and other exclusively business matters should be addressed to THE PUBLISHER, and not to the Editor.

PUBLISHER'S NOTICES.

Registered Telegraphic Address, "THE BUILDER, LONDON."

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PREPAYMENT IS ABSOLUTELY NECESSARY.

**** Stamps *must not* be sent, but all small sums should be remitted by Cash in Registered Letter or by Money Order, payable at the Post-office, Covent-garden, W.C. to
DOUGLAS FOURDRINIER, Publisher,
Addressed to No. 46, Catherine-street, W.C.

Advertisements for the current week's issue must reach the Office before THREE o'clock p.m. on THURSDAY, and for the front Page by the same hour on WEDNESDAY.

SPECIAL.—ALTERATIONS IN STANDING ADVERTISEMENTS or ORDERS TO DISCONTINUE same must reach the Office before TEN o'clock on WEDNESDAY mornings.

The Publisher cannot be responsible for DRAWINGS, TESTIMONIALS, &c. left at the Office in reply to Advertisements, and strongly recommends that of the latter COPIES ONLY should be sent.

PERSONS Advertising in "The Builder" may have *Replies addressed to the Office, 46, Catherine-street, Covent Garden, W.C. free of charge.* Letters will be forwarded if addressed envelopes are sent, together with sufficient stamps to cover the postage.

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READING CASES, { NINEPENCE EACH. { By post (carefully packed), 1s.

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